Regional Information Report No. 4K11-03

Hydroacoustic Survey of Rockfish Abundance and Distribution Operational Plan for the Westward Region

by

Philip Tschersich

April 2011

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye to fork	MEF
mideye to tail fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

This report specifies the methods and procedures for conducting a coastal hydroacoustic survey in the Kodiak Management Area for rockfish population size and distribution. Survey locations of probable black rockfish *Sebastes melanops* habitat are identified using commercial rockfish harvest logbook information, local knowledge from sport fishing charter operators and commercial jig fishermen, and bathymetric/bottom-type information from nautical charts. The survey uses a split-beam hydroacoustic transducer to locate and record individual fish acoustic signatures in the study areas. An underwater video camera is used to record images of fish in the study areas for later species identification. Mechanical jig machines and hand-held rod and reel are used to live-capture fish samples at the study areas to determine species, sex, length, and reproductive status.

Key words: Black rockfish, dark rockfish, dusky rockfish, *Sebastes melanops, S. variabilis, S. ciliatus*, hydroacoustics, underwater video, live capture, population, survey, Kodiak.

INTRODUCTION

In an ongoing effort to develop a district-level, population-based management plan for black rockfish *Sebastes melanops* in the Westward Region, the Alaska Department of Fish and Game (ADF&G) has conducted hydroacoustic surveys beginning in 2007 in the Kodiak Management Area (KMA; Figure 1). The Northeast District of the KMA was surveyed in 2007 in order to develop the methodology for determining rockfish habitat locations and extents, determine protocols for the collection and analysis of the hydroacoustic echogram, evaluate live-capture sampling, and record underwater video to determine species composition of the rockfish schools surveyed. Due to technical difficulties, underwater video was not used extensively in 2007, but the Northeast District was surveyed with the hydroacoustic system and rockfish were sampled at many survey locations through live capture. The survey of the Northeast District was repeated and refined in 2008, and extensive underwater video was recorded at most survey locations. In 2009, surveys were conducted in the Afognak, Eastside, and Southeast districts of the KMA. In 2010, surveys were conducted in the Westside District of the KMA and in the Sutwik Island, Chignik Bay, and Mitrofania districts of the Chignik Management Area (CMA; Figure 1).

OBJECTIVES

The objectives of the hydroacoustic surveys of rockfish are to collect data required to generate a population index for black rockfish, and to better understand rockfish species mixing and distribution where black rockfish coexist with other species of *Sebastes* in marine environments around Kodiak Island.

METHODS

SURVEY STATION SELECTION AND DESIGN

Introduction

The basis for the survey is to identify locations where rockfish associate with rocky or high-relief habitat, to explore the geographic extent of the habitat, and to then define boundaries within which the habitat and fish aggregations will be sampled using hydroacoustics. A single, contiguous area of habitat is called a survey station. All suitable rockfish habitat should be considered when defining survey stations. Before the survey takes place, a variety of information sources should be consulted to identify likely survey stations. These sources can include:

- commercial rockfish jig season logbooks that contain latitude and longitude and species data;

- interviews with commercial fishermen and charter boat operators who target rockfish;
- nautical charts or bathymetric maps that show depth and seafloor topology in order to identify likely rockfish habitats.

Once a probable survey station has been identified, a number of reconnaissance passes over the area will be done using the hydroacoustic equipment to assess the presence or absence of fish and to gain an understanding of the extent of the habitat and fish schools. If the habitat and fish aggregations are focused on a location with a single, defined central density such as a rock pinnacle, a star-pattern transect should be used to survey the area (Figure 2). The center of the pattern should cross over the center of the fish aggregation a minimum of four times. Because star pattern survey transects are used on a spatially focused set of habitat features or fish schools, the diameter of the star is typically set at 0.3–0.5 km.

If the habitat or fish schools are more spatially variable and cannot be adequately covered in a small-diameter star pattern, a series of grid-pattern transects should be used (Figure 3). The individual transect tracks, or legs, should be spaced 50 m apart for a grid pattern, though each leg can be of any length. The hydroacoustic survey should include the entire habitat area and extend beyond the main fish aggregations and bathymetric features of interest to ensure that the entirety of the area is sampled. If a habitat area is determined to be very large (e.g., greater than 2 km long or wide) or exist in a complex geometry, multiple adjoining grid stations may be created. It will require judgment on the part of the survey leader to determine the type of survey station pattern to use, and how large to make each grid.

A few considerations should be taken into account when laying out a grid. It is generally easier for the vessel operator to follow a track that falls along a cardinal compass direction (north, south, east, or west) or major intermediate directions (i.e., northeast, southwest, etc.) because 90 degree turns and reciprocal tracks are simple to calculate and enter into an autopilot. If the survey area being considered is longer along one axis than another (i.e., nominally not square), the major transect legs should be parallel to the longest axis (Figure 4). During final analysis of the echogram, each leg of the survey station is treated as an individual sample, so processing time increases with an increase in the number of legs. The distance traveled is the same in either case of transects lying along the long axis or short axis, and will result in the same calculated average density of fish, but the tradeoff in the reduced transect-processing time and ease of vessel navigation is a lower sample size (fewer legs) and an increase in calculated standard error.

Star pattern survey stations are typically drawn with four legs for 0.3 km diameter survey areas, one leg along each cardinal and intermediate direction: 1) north-south, 2) east-west, 3) northeast-southwest, and 4) northwest-southeast. The number of legs can vary between four and six and is dependent on the diameter of the star pattern. As a general rule, 0.3 km diameter stars will use four legs, and stars up to 0.5 km using six legs.

Once the survey pattern (grid or star) has been determined, it should be drawn into a nautical navigation and charting program in such a way that the vessel operator can follow it precisely, and so that either the vessel operator or a technician can enter marks in the navigation program indicating where fish concentrations were seen on the echogram. A screen shot from the nautical charting program Coastal Explorer 2009 is shown in Figure 5. Once the hydroacoustic data has been acquired, these fish concentrations will be revisited for underwater video and live-capture sampling.

Drawing Grid and Star Survey Routes

To draw a route in the program Coastal Explorer 2009, select the menu item *Insert* > *Route* (or hit F8). The arrow cursor will show a small plus sign (+) next to it, and clicking once at the desired start location will place a mark at that spot. As the cursor is moved away from the first mark a straight dashed line trails behind with the bearing and range indicated above and below the line, respectively, and projection and tangent lines are shown in magenta. Additional clicks places more points sequentially on the route. Use the bearing and range lines to align and determine the spacing of the route's legs. The main legs of a grid may be of any length, while the neighboring legs should be spaced 0.05 km apart. Double clicking will end the route, and individual marks along the route can be clicked and dragged to new locations in order to modify the route's shape. If the program is not showing distances in metric units, select menu *Tools* > *Options*, and under *Category* select *Measurements*.

Drawing a star is the same general process; however, it can be useful to begin by drawing a circle to help guide the placement of vertices of the pattern. Select the menu item *Insert* > *Boundary Circle* and click at the point where you want the center of the star to reside. A circle of approximately 0.5 km will appear. Make sure the *Properties* are visible in the *Task Pane* by clicking on *Properties* along the right-hand margin of the window. With the circle still selected (if not, click anywhere along the circle) in the *Properties* window under *Icon:* select a shape other than "none." A mark you have specified will now appear at the center of the circle. If you hover over the circle's edge, the hand cursor will have a four-way direction arrow next to it indicating that clicking and dragging will change the size of the circle. You will want to change the diameter of the circle to 0.3 km. To draw the star, select menu item *Insert* > *Route* (or hit F8) and begin to add points (Figure 6). Imagine the circle as a clock face. It is easiest to begin at the top of the circle at 12 o'clock and draw the first leg down to the bottom of the circle at 6 o'clock (so that the center mark you added falls along the line). The next mark should be placed approximately between 4 and 5 o'clock, and then extend the line across to the opposite side of the circle to between 10 and 11 o'clock (again, so that the center mark you placed falls along the line). Next click at 9 o'clock and extend the line horizontally across to 3 o'clock. The final leg will run from between 1 and 2 o'clock down to between 7 and 8 o'clock. Double click to finish.

Once the route has been drawn, the appearance of the route can be changed by selection options in the *Properties* area such as changing the route waypoint style, the route color, displaying direction arrows, displaying leg ranges and bearings, etc. It is also important to name any object you create. Grids generally follow the naming convention of an abbreviation of the district (e.g., NE for Northeast District) followed by either "Grid" or "Star", and then the number of that survey location (e.g. NE Grid 12). Marks indicating fish concentrations in a grid or star should be similarly named. Occasionally save the file navigation objects to the hard drive by selecting menu *File* > *Save.*

HYDROACOUSTICS

Introduction

For the rockfish surveys, a Biosonics DT-X 210 kHz split-beam Echo Sounder (transducer) is used. The Biosonics hydroacoustic system can provide a much higher resolution and more sophisticated view than most shipboard sonar equipment, and should be used when evaluating an area for possible surveying. The transducer is mounted on either a tow-beside sled or on a pole

attached to the vessel's gunnel. The advantage to the pole-mounted transducer setup is that it can be left in the water during all survey operations whereas the sled-mounted transducer needs to be lifted on board during vessel travel at speeds exceeding 5 knots and during live-capture and video sampling. In either configuration, the transducer must be approximately 2 m below the surface of the water at a depth sufficient to ensure it is out of any bubble layers or turbulence created by the boat. The data from the transducer is fed through the Biosonics DT-X surface unit housed in a Pelican case where GPS position information is added to the data stream, and then it is transferred to a computer via an ethernet cable for real-time viewing and recording on a computer in Biosonic's Visual Acquisition software program. A complete description of setting up the transducer, cables, and controller can be found in Appendix A1. A description of using the program Visual Acquisition to record and view the echogram can be found in Appendix A2.

Hydroacoustic Acquisition

The hydroacoustic transducer ***must be in the water*** before pinging is initiated or else the ceramic element may be permanently damaged. The hydroacoustic echogram can be viewed whenever the transducer is in the water without actually logging (recording) the data to the computer hard drive. The vessel operator should maintain a speed of about four knots during the duration of logging the echogram. When not actively logging the echogram, the vessel can be operated at up to eight knots before turbulence across the transducer face introduces noise on the echogram when using the transducer mounted on the pole. The sled-mounted transducer should never be towed faster than five knots as the sled tends to rise in the water column at higher speeds.

Before surveying a station, the water temperature and salinity should be measured at a depth of approximately two meters and entered as environmental parameters into the Visual Acquisition program to ensure the correct speed of sound in water is used when logging the echogram (Appendix A1). Approximately a minute before the vessel begins driving down the first leg or transect, logging (recording) of the echogram should be initiated to ensure things are operating correctly before entering the grid or star. For each station, the operator of the hydroacoustics will keep a detailed logbook in which they will record the

- date,
- fishing district the survey is taking place in,
- survey station name (e.g., Southeast Star 07),
- water temperature and salinity,
- exact time the echogram starts to be logged,
- full name of each .dt4 file being written when the echogram is being logged (e.g., SE_Day_12_20090824_120847.dt4),
- and the exact time the echogram logging is stopped.

The echogram data is logged to a .dt4 file by the Visual Acquisition application. The technician should set the prefix of the file name to a logical string for later reference. For this project, the prefix should be set to the fishing district being surveyed, followed by the survey day number, and then followed by the file number that the software assigns. An example would be *SE_Day_12_20090824_120847.dt4* where *SE* stands for Southeast, *Day_12* refers to the day of that district's survey, and finally the software assigns a YearMonthDay_HourMinuteSecond

string corresponding to the exact computer time the logging began. The .dt4 streams are broken into files corresponding to a predetermined time interval (e.g., 15 minute, 30 minute, etc), each with the same file name but with the minute portion of the name advancing by the time interval in minutes for each file during a continuous recording session. For instance, the second file written during the session in the example given above would have the name *SE_Day_12_20090824_123847.dt4* if the time interval was set to 30 minutes.

As the vessel approaches the first leg of the survey station, the hydroacoustic technician ensures that the threshold and depth of the echogram are set such that they will be able to see any fish in the hydroacoustic beam, and then begin logging the echogram to the computer hard drive. The technician should confirm with the vessel operator that the logging has begun and that they are prepared to transit and record the entire survey station. Record the information related to the station in the logbook. If any problems are encountered with logging the echogram or with the vessel navigating the station, it is better to begin the station over again logging a new set of .dt4 files.

Once the vessel is on the station and the echogram logging has begun, the technician should continue to monitor the echogram and the vessel's progress through the station. Any significant numbers of fish should be accurately recorded as marks in the navigation program so that once the logging of the station is complete the fish schools can be located and sampled using video and live capture for species identification.

Once the hydroacoustic survey is complete, the technician should record the exact computer time when the .dt4 file logging was stopped in the logbook and discuss the location and strategy for acquiring video and live samples from fish schools in the station with the vessel operator. If the transducer is mounted on a tow sled, that would be the proper time to ***stop all the pings*** and lift the sled aboard the vessel. If the transducer is pole-mounted, it may be left in the water and continue to ping (though the logging will be turned off).

These surveys represent a large investment in time and capital, so it is important to protect the data collected by backing up the .dt4 files each day to a second, external hard drive. The .dt4 data is stored on the main computer hard drive at the following location: C:\BioSonics\VisualAquisition6\data. The prefix of the name of each file is set by the user when it was created in Visual Acquisition, so finding that day's files is simply a matter of sorting the file list by file name or sorting the folder contents by the date the files were modified.

SAMPLING FOR SPECIES DETERMINATION

Introduction

While adult fish of the genus *Sebastes* can generally be identified from the echogram, a species-level determination of rockfish in aggregations needs to be made visually by either underwater video or by capturing the fish with hook and line and bringing them to the surface. The video will generally result in a larger sample size of fish being identified, and the video is not affected by species specific rod and reel selectivity. Because of these factors, acquiring quality video footage from a variety of locations on a grid, or from the main fish aggregation in a star, is of primary importance and live sampling is done opportunistically in conjunction with the video.

Underwater Video Sampling

Underwater video should be recorded at all stations surveyed. A detailed explanation of connecting the video camera gear is given in Appendix B1. Weather conditions such as cloud cover and sea state will affect the quality of the video recorded, and this will, in turn, affect the number of fish which can be identified in the recording. A calm sea state reduces the camera 'bounce' and calm winds reduce the distance the passive drop camera trails behind the drifting boat. The limit of effective camera working depth depends on a number of factors including available ambient light and visibility. Typically, good footage can be recorded from the surface down as deep as 25 to 37 m (14 to 19 fathoms). Occasionally the conditions allow for decent recordings to be made from 35 to 45 m (19 to 25 fathoms) in depth, though recording good footage deeper than 45 m (25 fathoms) is rare. The camera system is equipped with an artificial light source, though this does not extend the useful working depth very much. Water turbidity generally creates a 'blizzard' effect when artificial light is used. Discerning the difference between the similar-looking dark *Sebastes ciliatus* and dusky *S. variabilis* rockfish can be aided with the addition of artificial light, and certain colors can only be seen at depth with artificial light due to different spectral attenuations of natural light being filtered through water.

For these rockfish surveys, Insite Pacific Inc. Pegasustm NTSC video cameras are used and recorded to digital video (miniDV) cassette tapes. The cameras and light sources are enclosed in a robust housing made from a rigid plastic trawl float and suspended in the water column via a hand-held cable over the side of the vessel. Colored cable ties or tape are attached at one fathom intervals along the cable to determine the approximate amount of cable that is paid out.

The vessel operator will move the vessel into the location identified during the hydroacoustic portion of the station survey and will use sonar or the Biosonics hydroacoustic echogram to locate the fish schools again. The vessel operator should determine the direction the vessel will drift and position the boat accordingly so that it moves over the fish aggregation. The drift should be mostly passive though slight compensations for wind or tidal current can be made with the engines as long as it does not cause the drop camera to 'fly' or get dragged by the moving boat and so that the ship's propeller does not pose a danger to any gear. The video camera operator should view the footage being recorded in real time using a deck monitor and should adjust the camera depth accordingly to record as many fish as possible while ensuring the camera does not contact or become entangled with the bottom. Rockfish generally live in close proximity to the bottom in rocky habitat, and having the camera drift through the location while staying near the seabed will usually lead to recording the greatest number of fish, but also requires a high level of vigilance by the operator to follow the terrain without damaging the equipment. Controlling the heavy camera and cable in deep water is a physically demanding task, which is compounded by waves, windy conditions, and strong tidal currents. When the conditions allow, the camera cable can be temporarily locked into a cam cleat mounted on the vessel's rail. Camera retrieval can be made easier by engaging the vessel's hydraulics and lifting the camera using a set of modified shims on a crab block which provide friction on the cable without damaging the wires inside. The camera should be lifted slowly and care must be taken so that the powerful hydraulics do not put excessive strain on any portion of the video equipment.

Multiple drifts in a number of locations in each survey station should be done until sufficient video has been recorded to identify the general proportion of fish species in the station. The number of camera drops this requires depends greatly on the specific location. In stations with large aggregations of fish, hundreds of fish may be recorded to video per camera drop while

more sparsely populated stations may result in few fish being recorded to video. Keep in mind that four to six stations may be surveyed per day and the amount of time spent attempting to acquire good video footage needs to be balanced against the other work that needs to be accomplished. As general guidelines, the following points should be considered when deciding how long to record video at a given survey station:

- During past surveys, for every four or five fish recorded on the echogram, one fish has been identified from the video footage.
- Stars that require approximately 20 minutes to survey with hydroacoustics should receive two or three camera drifts of about five minutes duration through the center concentration of fish, and additional drifts over fish concentrations outside the star's center.
- Grids should receive underwater video coverage at every major fish school observed on the echogram. A good goal is to observe approximately 100 fish per drift location on the video.
- The amount of video recorded may be influenced by water and light quality with more time needed to positively identify a sufficient number of fish under limited visibility or poor light conditions.
- Approximately as much time should be spent recording video as was spent acquiring the hydroacoustic echogram.

Applying a time and date stamp to the video footage recorded is essential for subsequent editing and viewing. With the equipment we have used on this survey, the best way to do this is to pass the video footage through one digital video recorder (DVR) which places a time and date stamp on the image, and then record it on a second DVR. The intermediate 'dummy' or pass-through recorder has a tape that is rewound and re-recorded each time the 'real' tape in the second recorder is filled and exchanged for a new blank tape. Good record keeping is critical in linking the video recorded with the survey station and location. An example of the video log form is shown in Figure 7. The first column is the *Index Number* which will be filled in after the survey is complete and the information has been entered into a database. Enter the date, the name of the grid or star, and nearest Headland or Bay. The clock time corresponds with the time of day the video was recorded in an a.m./p.m. format. This time should be visible on the video recorder in the time stamp at the time of recording. A GPS position should be taken at the start and end of each drift when video is recorded and entered as the start and stop waypoint number on the video log form. The video counter time (in minutes and seconds) should be noted along with the approximate depth the camera was suspended (in fathoms). Any observations regarding water clarity or species seen can be entered in the comments field. Each video log sheet should have the header filled out that includes the year, the district being surveyed, the vessel, and, most importantly, which GPS was used to mark the waypoints.

The video files will be transferred to computer hard drives and edited to remove extraneous footage lacking identifiable fish. Each edited video file will be watched twice by a technician trained in identification of the common local rockfish species, and the respective species counts will be recorded. Black rockfish are easily identified on video based on obvious light-colored markings along the dorsal surface under ambient light underwater. Dark and dusky rockfish are more difficult to differentiate from each other. These latter two species are divided into three categories during analysis of the video: individual species counts were made of 1) fish positively

identified dark rockfish, 2) fish positively identified dusky rockfish, and 3) a dark/dusky category was created for those fish which could not be placed confidently under either species.

Live-Capture Sampling

After the hydroacoustics have been logged for the survey station, live-capture sampling will be conducted along with the collection of underwater video at locations identified as having fish concentrations on the echogram. Generally it is possible to use the fishing gear concurrent to the video camera being in the water. The GPS marks denoting the start and end of each video drift can be used to indicate the capture locations during live sampling.

The fishing gear and the underwater camera drift at different rates, so if the boat is moving significantly due to wind or tidal current care must be taken to avoid entanglement as the hooks on the fishing gear can damage the camera cable. The recording of video takes precedent over live-capture sampling, so if entanglement becomes a problem at a particular station, suspend live-capture sampling until conditions improve.

An electronic commercial fishing jig machine (model 03-16 Oilwind™ Inc.) and rod and reel are used to live-capture samples using artificial bait hooks. The electronic jig machine must be connected to a 24 volt direct current (24v DC) power supply. Two 12 volt automotive batteries are connected ***in series*** in order to achieve 24 volts. Once power is supplied to the jig machine, it is automatically turned on. In order to turn the machine off, it is necessary to unplug the machine or otherwise interrupt the power to it.

The jig machine has many sophisticated functions, but basic operation is straightforward. Complete operating instructions for the Oilwind jig machine can be found in Appendix C1. General instructions for rigging jig gear and hooks can be found in Appendix C2. On the keypad, pressing the *Down* button causes the machine to pay out line until the weight reaches the bottom and the machine starts fishing (Figure 8). Because the sampling generally occurs over rocky bottom, it is preferable not to have the jig gear contact the sea floor but rather fish a few meters above it. The maximum depth can be set by pressing the *Depth Adjust* button and then pressing either the *Plus* or *Minus* buttons to change the maximum depth in fathoms, and then pressing the *Down* button in order to fish at that depth (Figure 8). Ask the vessel operator to inform you of the current depth in fathoms, and to continue to update you if the depth changes, and make adjustments to the maximum fishing depth as required. Losing the fishing weight and the jig hooks is very disruptive to the sampling process and should be avoided if possible. Rockfish can generally be found from approximately two to six meters (one to three fathoms) above the sea floor.

The jig machine is designed to sense when fish have been caught and may sound a warning noise, or the operator may observe the roller arm bouncing from the struggling fish. Pressing the *Stop / Retrieve* button once stops the fishing operation, and pressing the button a second time causes the jig machine to reel the gear back to the surface. At approximately 5 meters from the surface the jig machine will make a series of beeping sounds and will slow down the retrieve speed until the hooks arrive at the surface. The stopper ring separating the fishing line from the hook leader will reach the roller arm and stop automatically. The operator can then swing the weight over the boat's rail and remove the fish from the hooks. Care should be taken not to injure the fish unnecessarily. Once the fish have been removed the weight can be suspended back over the water and fishing can resume while the operator measures each fish.

Rockfish caught should be examined to determine their species, sex, and length (tip of snout to tail fork, to the nearest 1 cm), and these data should be recorded on a live-capture sampling data form (Figure 9). Each capture should be associated with GPS coordinates, generally taken in conjunction with the video recording. A note on the sexual maturity of rockfish can be made in the comments column of the live-capture sampling form if they are extruding eggs, larval young, or sperm. Table 1 describes the main characteristics differentiating black, dark, and dusky rockfish. The same information is shown in photographic form in Figures 10–12. Sex may be determined by examining the external structure of the urogenital papillae (Figure 13). Learning to correctly identify rockfish species and sex takes time and practice, so if any difficulty is encountered seek the advice of someone on the survey with more experience. If no sex determination can be made confidently it is better to code the fish as *unknown* (code 3) rather than guess. Although the main objective of this survey is to document rockfish populations, all species captured should be recorded on the sampling forms.

Fish caught at depths below 35 meters (19 fathoms) may suffer barotrauma when they are brought to the surface. The swim bladder expands and gasses dissolved in the fish's tissues come out of solution, and the fish may become too buoyant or stunned to swim back down unassisted. The various species tend to react to barotrauma differently, with black rockfish being relatively hardy and able to dive again with minimal assistance, while dusky rockfish caught at the same depth may experience more difficulty recovering. A mechanical release-at-depth device has been used to reintroduce the fish to deep water before letting them go in order to minimize the effects of barotrauma. The device is made from a modified nylon hobby clamp with a fishing weight suspended at the end of a fishing line, and is designed to open when the line is tugged (Figure 14). The rockfish is gently gripped at the lower mandible by the padded clamp jaws and lowered into the water and then sinks passively using the fishing weight. Once 15–20 m of line has been paid out, a sharp tug or two on the line should open the clamp and release the fish.

If a significant number of the fish being caught are suffering barotrauma and too much time is being spent trying to reintroduce the fish to depth, or attempts to sink the fish are unsuccessful, live-capture sampling should be suspended until a new location is sampled.

TABLES AND FIGURES

Table 1.–Morphological characteristics differentiating black, dark, and dusky rockfish.

	Rockfish Species		
	Black *S. melanops*	Dark *S. ciliatus*	Dusky *S. variabilis*
Dorsal/lateral body color	Black or dark grey, some mottling possible	Nearly uniform black or dark greenish-brown	Greenish-brown
Ventral body color	Light grey or white	Nearly uniform black or dark grey, occassionally with an orange or pink color hue	White or beige with a pink or orange hue
Fin color	Black	Black or dark grey	Tinged with a pink or orange hue
Symphyseal knob	Absent	Present	Present
Lower jaw pores	No visibly large pores	3 large pores on each side of lower jaw	3 large pores on each side of lower jaw

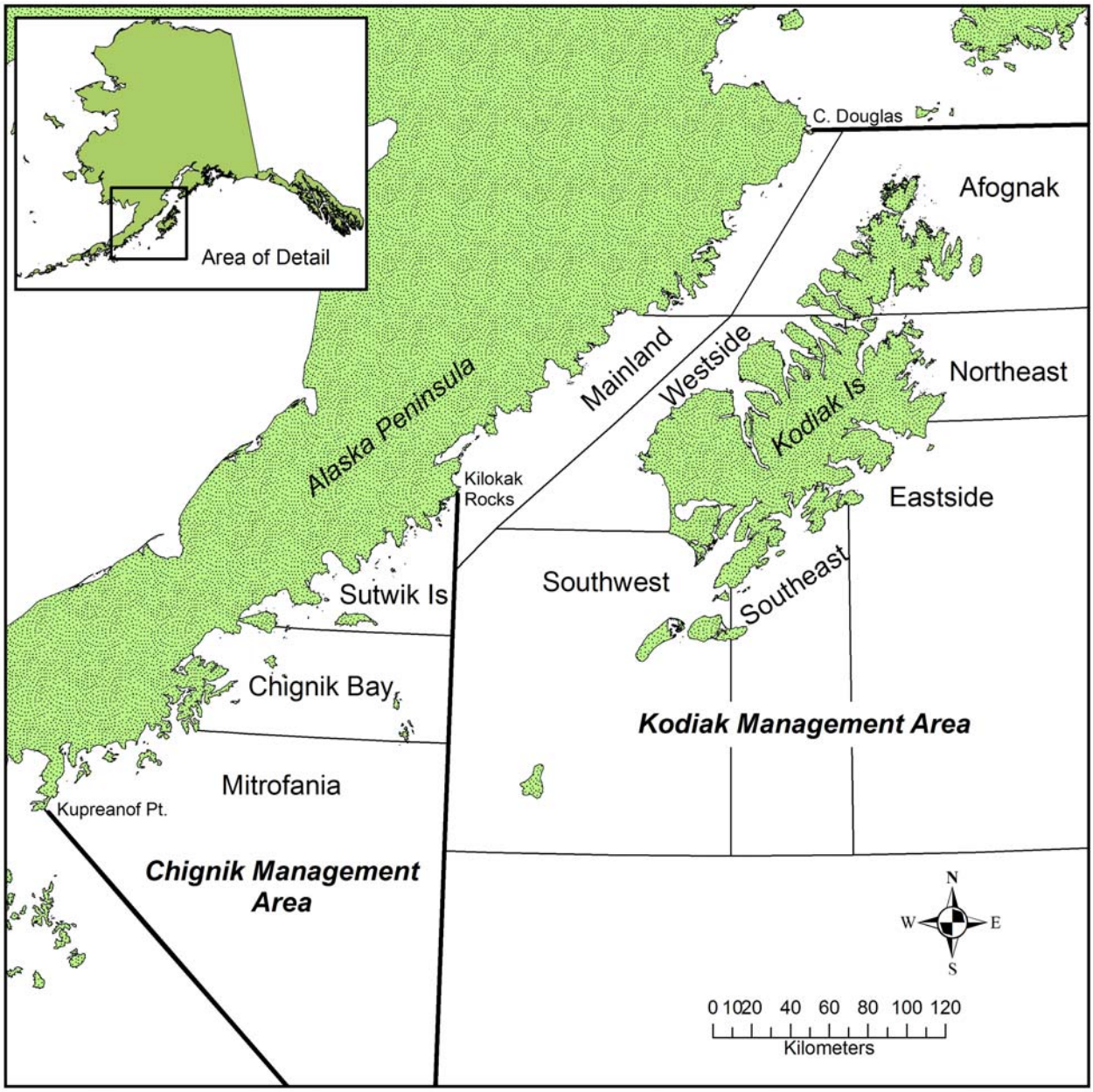


Figure 1.–Map showing the Kodiak and Chignik management areas and fishing districts.

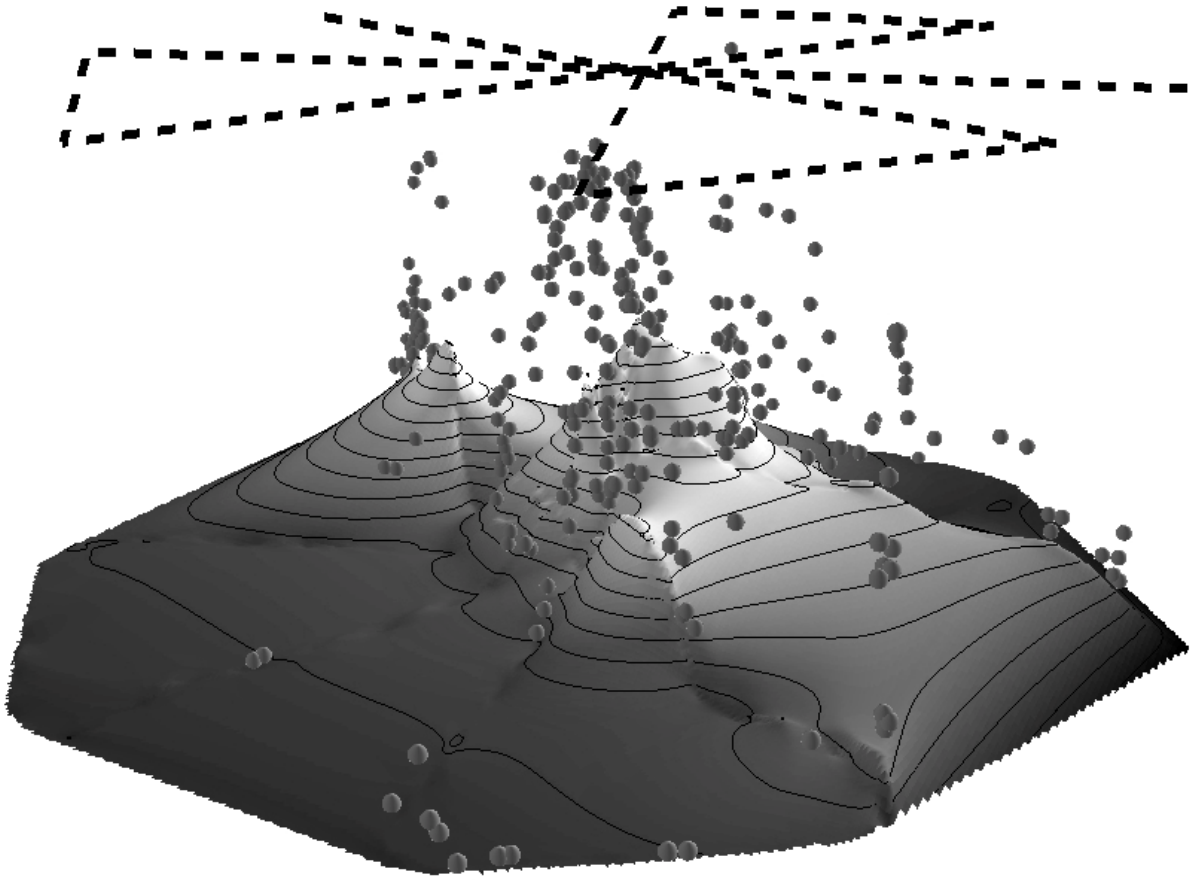


Figure 2.–Example of a star pattern vessel cruise track (dashed line) over a rock pinnacle with rockfish locations indicated in the water column (grey points).

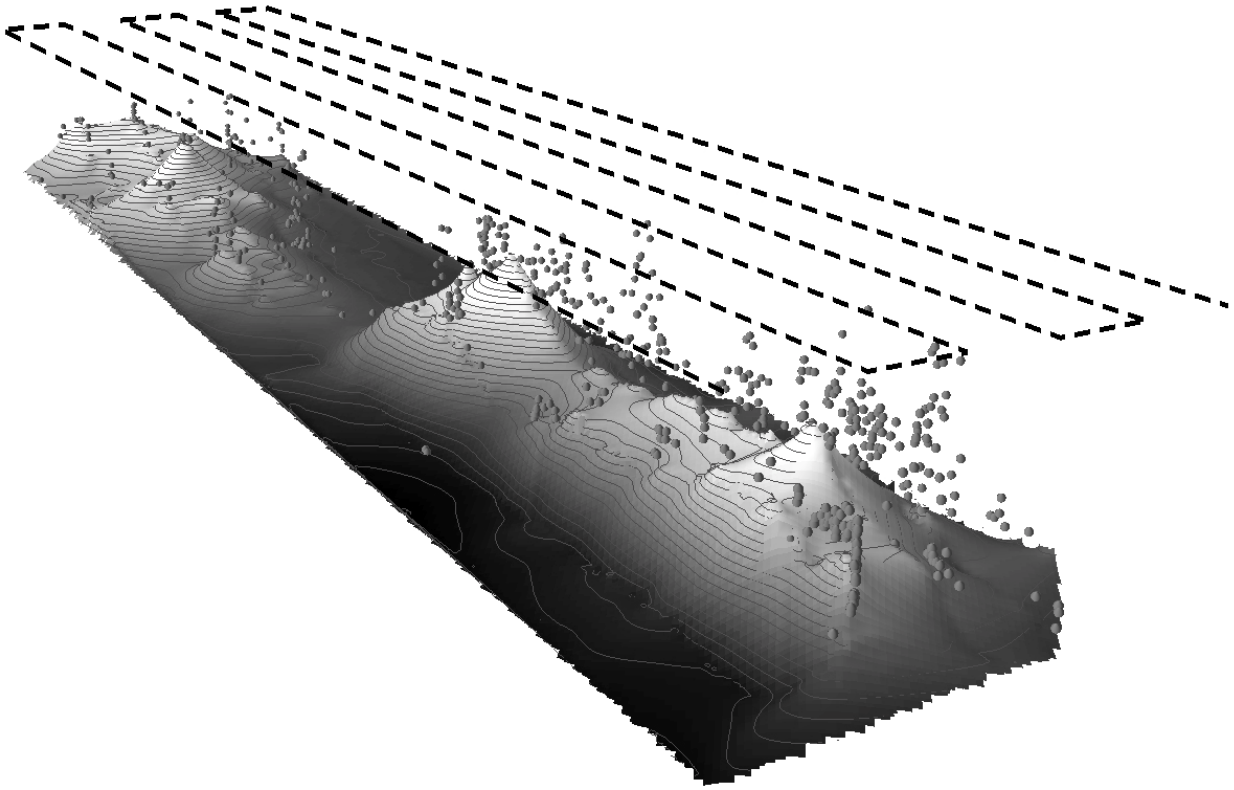


Figure 3.–Example of a grid pattern vessel cruise track (dashed line) over a rock reef with rockfish locations indicated in the water column (grey points).

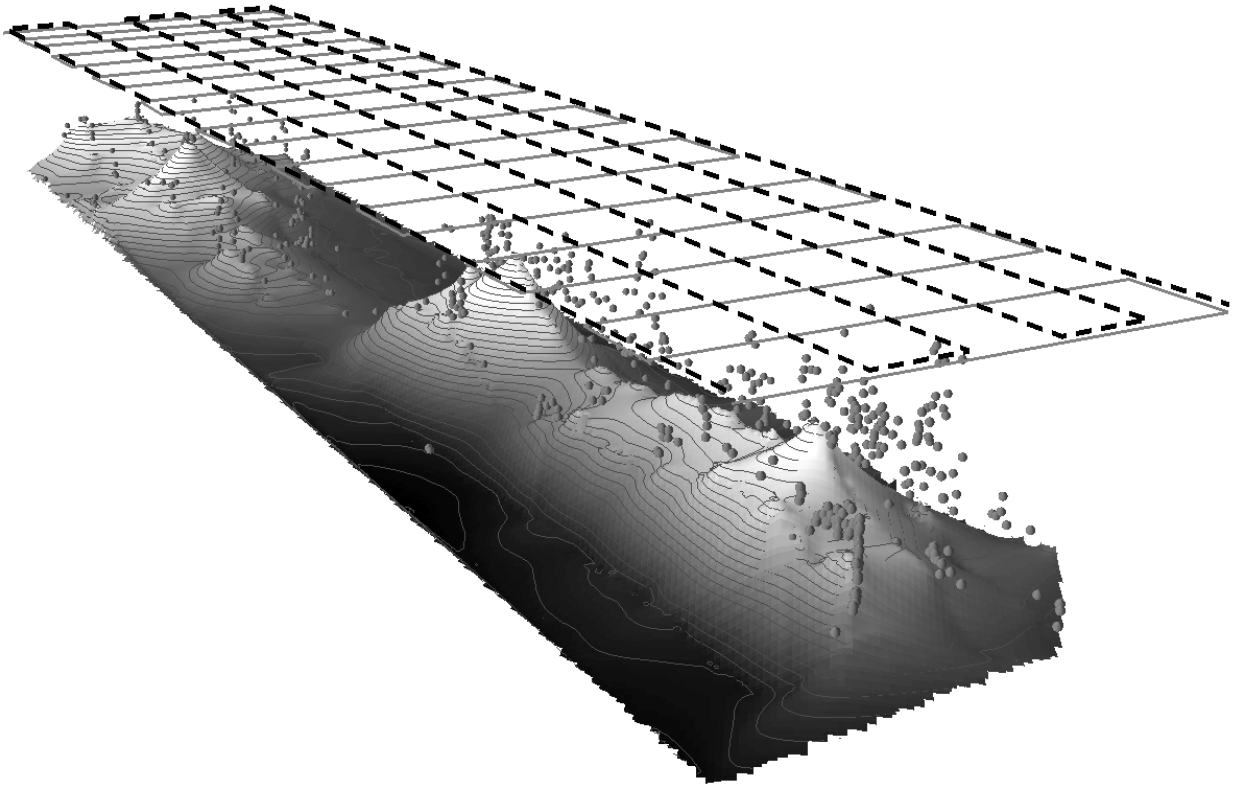


Figure 4.–Example of a grid pattern parallel to the survey area's long axis (dashed line) resulting in 6 legs, and parallel to the short axis (grey line) resulting in 20 legs.

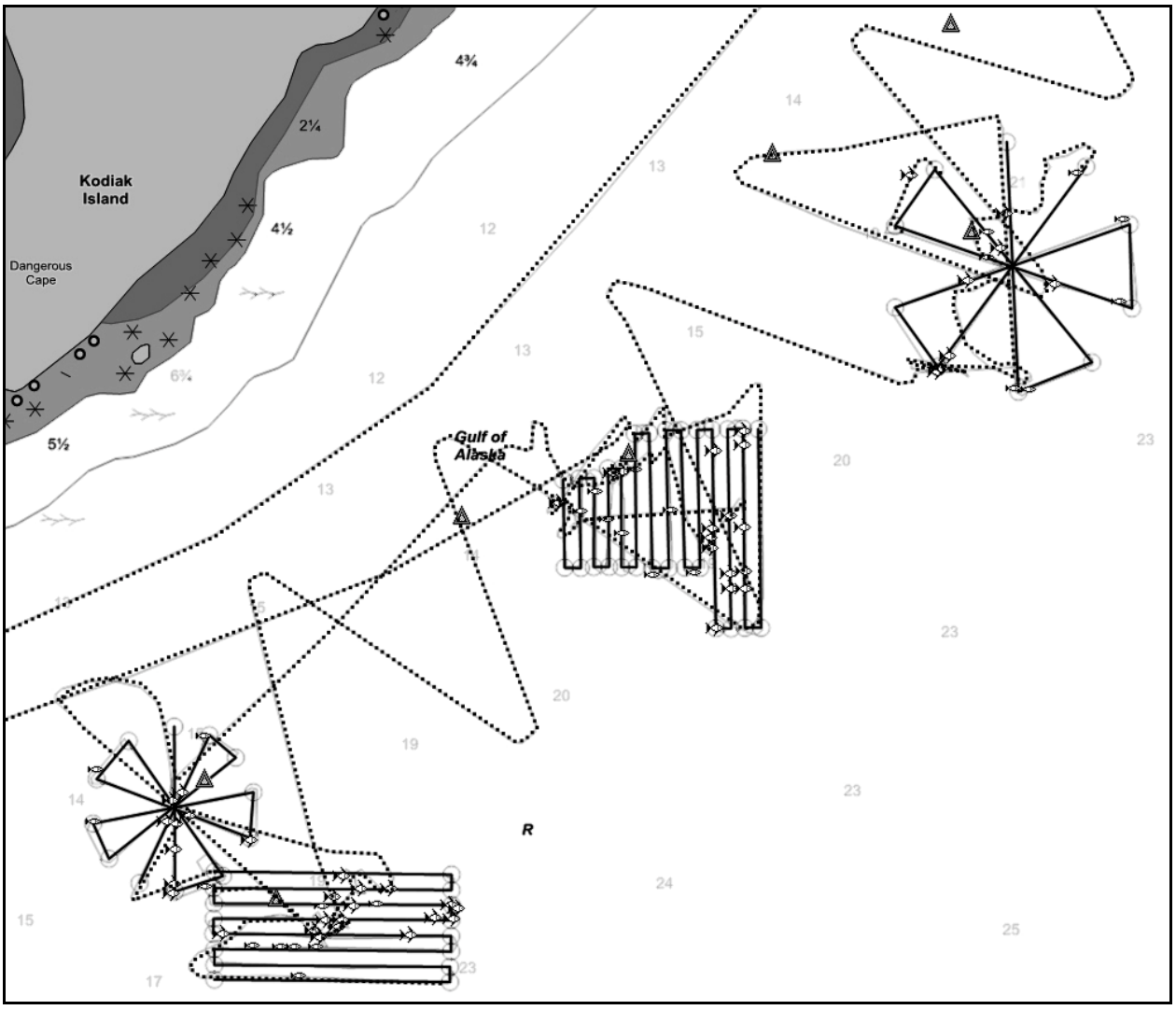


Figure 5.–Screen shot from the nautical charting program, Coastal Explorer 2009, showing the vessel's track (dashed line), rockfish logbook harvest record locations (hollow triangles), survey grids and stars (black lines), and locations of fish concentrations seen on the hydroacoustic echogram during the survey (large and small fish symbols).

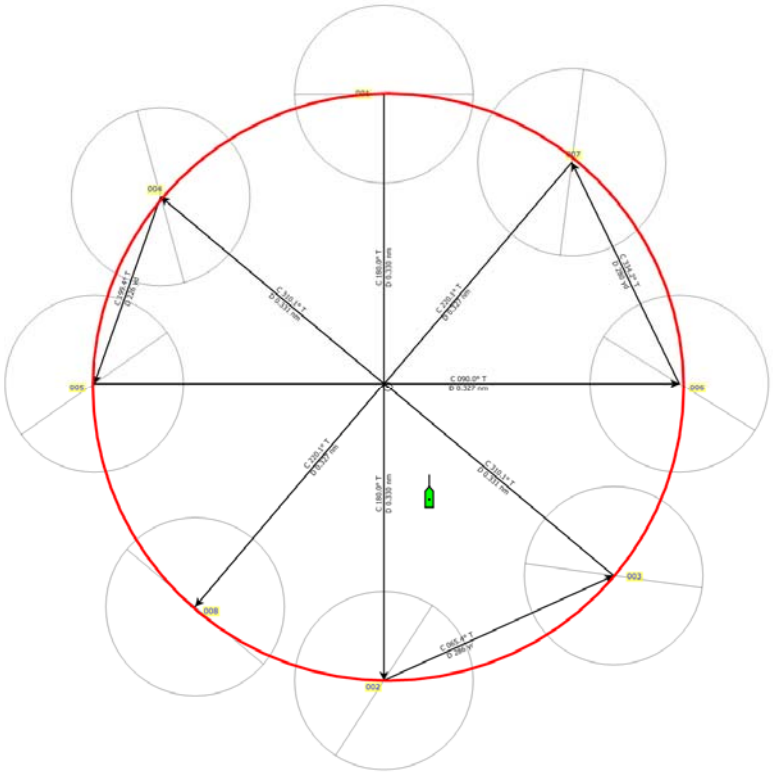


Figure 6.–Example of a star pattern survey route drawn in Coastal Explorer.

Rockfish Hydroacoustic Survey Video Log GPS *555* Page *4* of

Year *2009* District *Southeast* Vessel *K-Hi-C*

Index No.	Date	Area Grid/Star	Location Headland/Bay	Clock Time Start	Clock Time Stop	Start WayPt	Stop WayPt	Tape No.	Video Time Start	Video Time Stop	Depth (fa)	Comments (species, visibility, bottom type)
	24-Aug	*SE Star 07*	*Dangerous Cape*	*12:08*	*12:17*	*355*	*356*	*12*	*43:20*	*52:06*	*14*	*Lots of blacks, few duskys*

Figure 7.–Video log form.

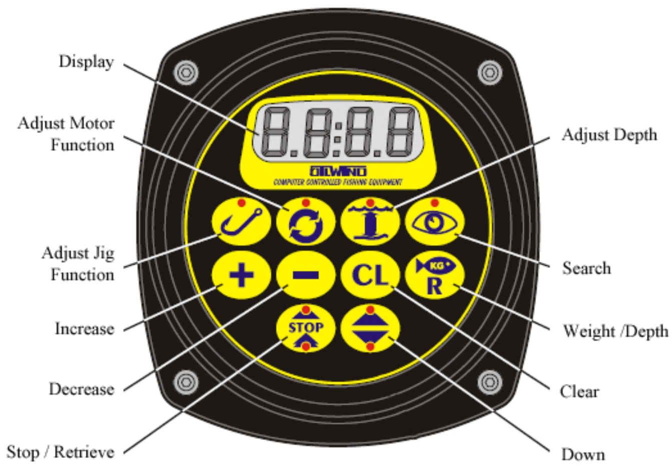


Figure 8.–Oilwind electric jig machine control panel layout and buttons labeled.

Rockfish Live Capture Sampling Form Page ___ of ____ Entered:

Date:	**Vessel:**	**GPS:**	**Samplers:**

Species	Length	Sex	Wypt	Grid / Star No.	Comments	Index

Species:	Black = 142	Rougheye = 151	Sex: 1 = Male
	Dusky = 172	Yelloweye = 145	2 = Female
	Dark = 173	Tiger = 148	3 = Unknown
	China = 149	Yellowtail = 155	

Figure 9.–Live-capture sampling form for recording rockfish species and biological attribute data information.

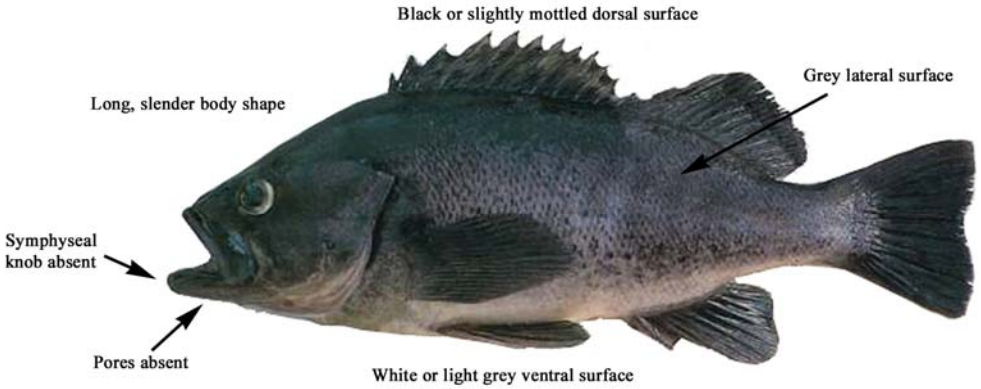


Figure 10.–Black rockfish *Sebastes melanops* distinguishing characteristics.

Figure 11.–Dark rockfish *Sebastes ciliatus* distinguishing characteristics.

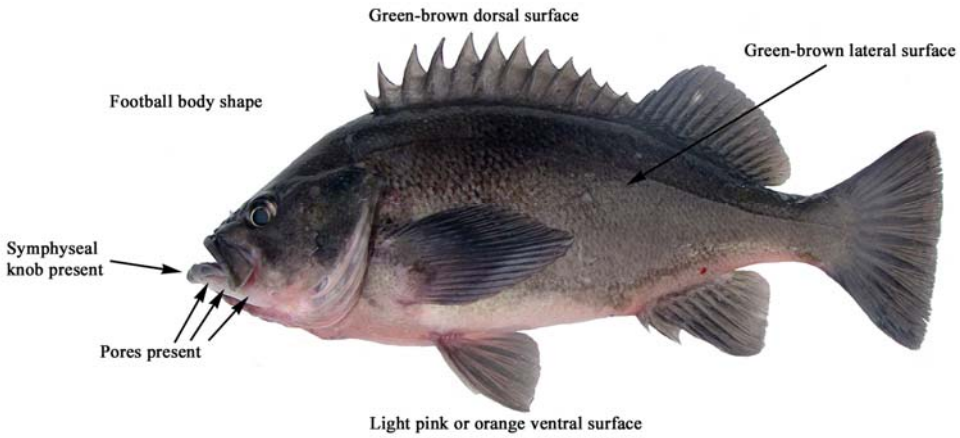


Figure 12.–Dusky rockfish *Sebastes variabilis* distinguishing characteristics.

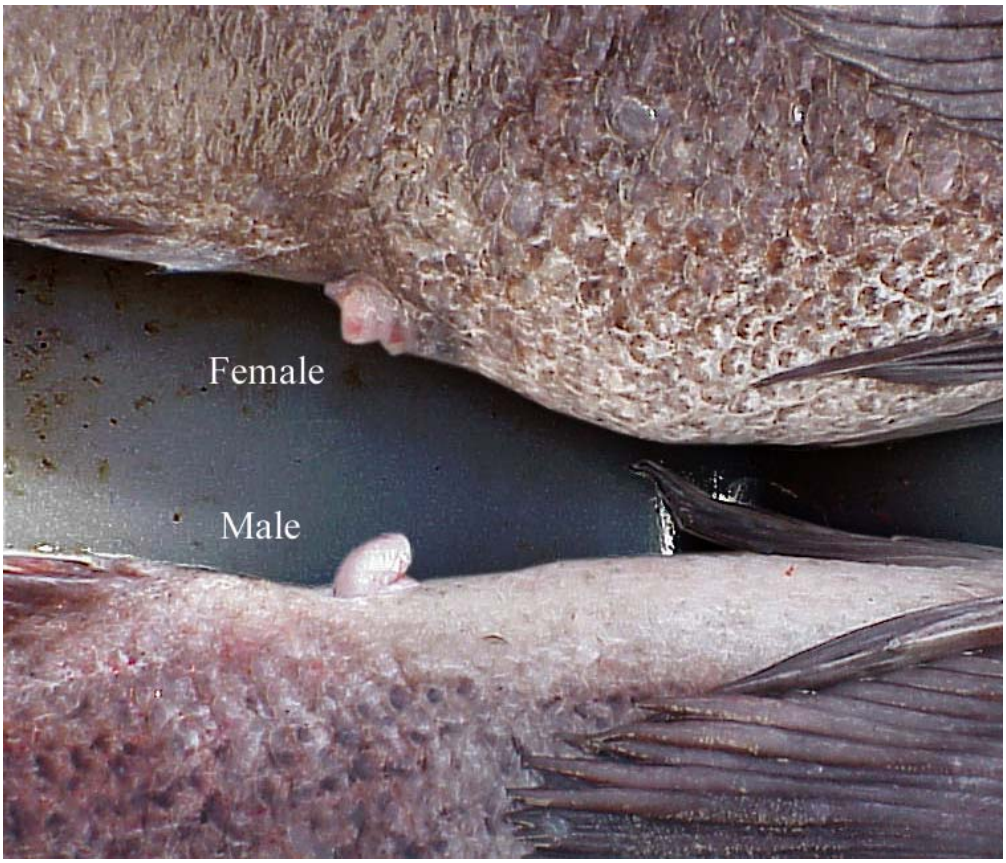


Figure 13.–Determining sex in common rockfish species by the urogenital papilla.

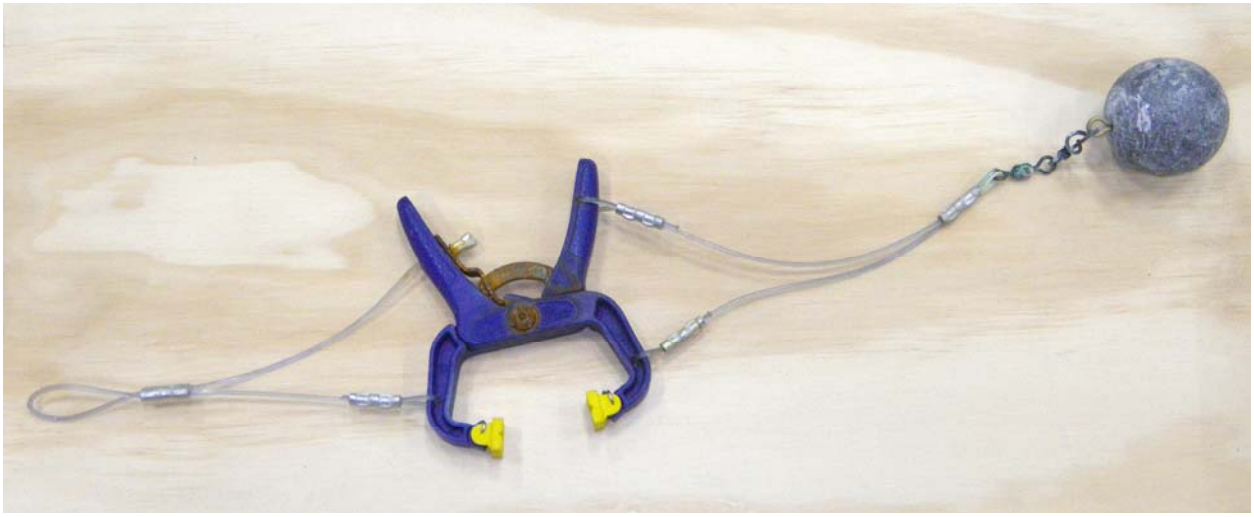


Figure 14.–Mechanical release for reintroducing fish suffering from barotrauma to depth.

APPENDIX A. HYDROACOUSTIC SYSTEM

Appendix A1.–Configuration of the Biosonics hydroacoustic transducer, cable, DT-X controller, GPS, and computer.

The Biosonics DT-X system collects data from a number of components and sends that data to a computer for visualizing and recording. Hydroacoustic information is collected by the echosounder's transducer while spatial information is collected via a GPS antenna, and the resulting spatially and temporally correlated echogram is displayed by the program Visual Acquisition. This appendix describes how to connect the hardware required for hydroacoustics using the Biosonics DT-X system.

A number of components will be assembled to collect the hydroacoustic and position data. A GPS receiver antenna (Figure A1.1) is mounted in a high location on the vessel with an unobstructed view of the sky, and the cable is routed into the vessel's cabin to the Biosonics DT-X surface unit housed in a Pelican case.

Figure A1.1.–GPS receiver antenna for Biosonics DT-X hydroacoustic system.

The hydroacoustic transducer (shown below, left) is mounted on a tow sled or on the end of a pole attached to the vessel's gunnel. The rubber-coated ceramic face (Figure A1.2) is extremely sensitive and must not be damaged in any way. Oils and other products should not be allowed to come in contact with the transducer face as these will change the acoustic interface with the water and provide inaccurate data. The transducer data cable (Figure A1.2) is attached via a waterproof connector to the transducer. Silicone dielectric grease or an electronics-safe water dispersion spray lubricant such as silicone or Corrosion Block (Midwest Corrosion Products, Lancing MI) should be used inside the plug interface. The outside of the connection can be wrapped in electrical tape for extended deployments such as when mounted on the transducer pole. The end of the transducer cable with the green metal military-style connector is routed into the vessel's cabin to the Biosonics DT-X surface unit.

Figure A1.2.–DT-X transducer and cable.

The Biosonics DT-X surface unit (Figure A1.3) is placed on a flat surface using restraints or a grip pad, in a dry location on the vessel, where it is not in danger of a fall or splashing in heavy seas.

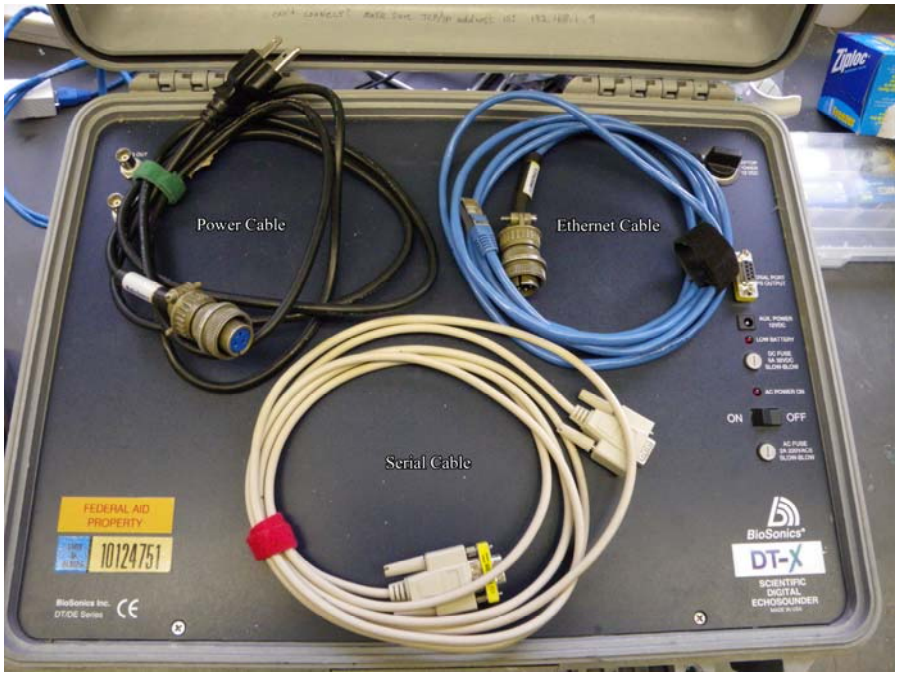


Figure A1.3.–Biosonics DT-X surface unit.

On the back and side panels of the Biosonics DT-X control module Pelican case are a number of military-spec waterproof electronics plugs. All the cables that will attach to these plugs are unique so there is no danger of attaching the wrong cable to a plug. The four connections (Figure A1.4) that will be made to the DT-X Pelican case are:

- 110v AC cable to power supply
- GPS data cable to GPS receiver
- Echosounder data cable to transducer
- Ethernet cable to computer

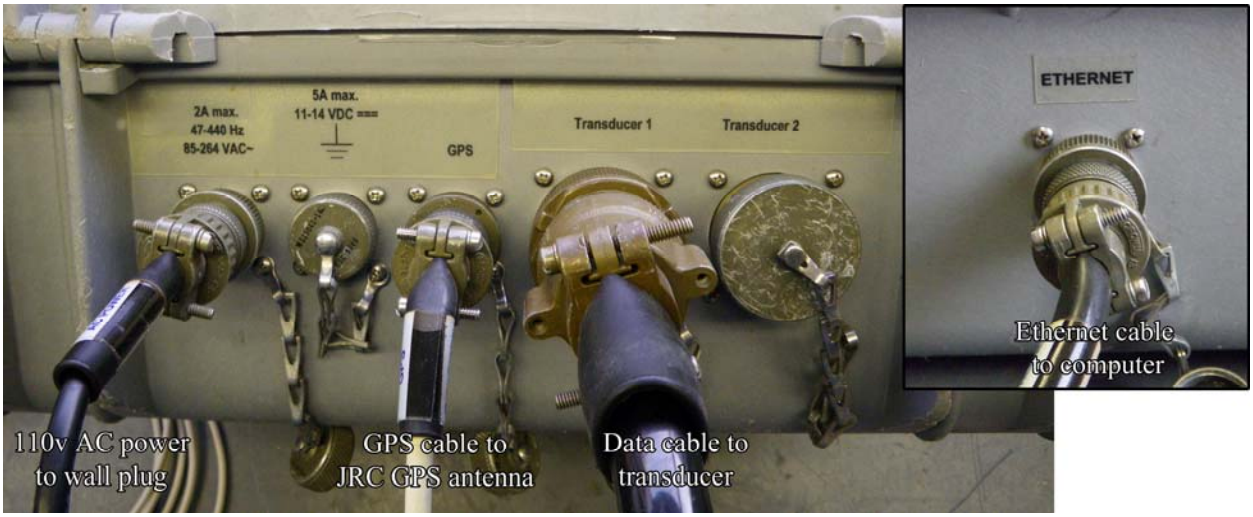


Figure A1.4.–Biosonics DT-X control module cable connections

All military-spec connectors should be fully seated with the threaded collar turned fully clockwise to tighten, and then backed off a quarter turn. It is not necessary or desirable to have these connectors made overly tight. The Ethernet cable from the Biosonics DT-X surface unit is connected to the Ethernet port on a computer. The serial connection can be used to send a GPS NMEA data stream to another program in the computer if that becomes necessary.

Appendix A2.–Use of Biosonic's Visual Acquisition to record and view the echogram.

The interface used to view and log the echogram created by the hydroacoustic system is a program called Visual Acquisition (Figure A2.1). It uses a real-time, side-scroll view to display the echogram much like a shipboard downsounder. In the program, the operator can set the environmental parameters such as water temperature and salinity (which affect the speed of sound in water), file naming and recording protocols for logging the echogram, and many other settings which affect how the echogram is viewed and what data is logged.

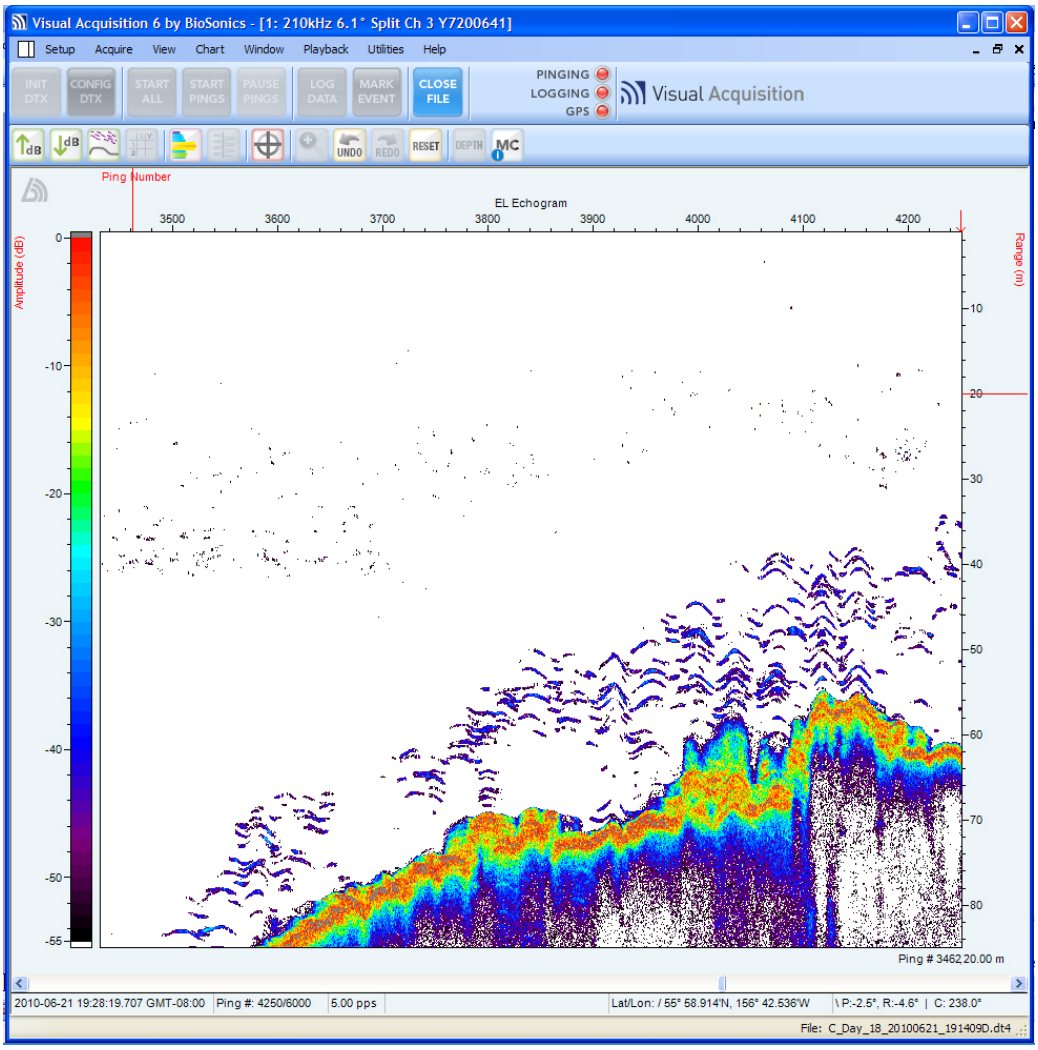


Figure A2.1.–Screen shot from Visual Acquisition 6.

Outlined below are the specific steps used to initialize, view, log, and shut down the Visual Acquisition environment. More comprehensive information about the program can be found in Appendix A3. The hydroacoustic transceiver unit ***MUST*** be submerged in water before pinging can be initiated or irreparable damage will occur to the ceramic element in the unit. Before initializing the unit, a temperature and salinity reading of the water should be taken using the YSI 30 sensor (Figure A2.2). Press the ON/OFF button to power the unit, and suspend the weighted electrode at the end of the unit's cable over the side of the vessel and allow it to sink to approximately 2 m depth. Take a salinity and temperature reading and record these in the survey logbook.

Figure A2.2.–YSI 30 salinity and temperature meter.

1. Check all the cable connections including the:
    a. power,
    b. GPS cable to the GPS antenna,
    c. cable to the transducer,
    d. and the Ethernet cable to the computer.
2. On the laptop computer, check to IP address to ensure it will receive data from the DT-X unit.
    a. Go to *Start* > *Settings* > *Control Panel* > *Network Connections* > *Local Area Connections*
    b. Under the *General* tab, under *This connection uses the following items:* click the *Internet Protocol (TCP/IP)* item
    c. Click the *Properties* button
    d. Select the *Use the following IP address* radio button
    e. In the *IP address* field, type *192.168.1.9*
    f. In the *Subnet mask* field, type *255.255.255.0*
    g. Click OK and close the control panel.
3. Turn on the power switch in the DT-X control module Pelican case (a red LED will illuminate). After about 20 seconds a beep will sound.
4. Start the Visual Acquisition 6 software; *Start* > *Programs* > *Biosonics* > *Visual Acquisition 6* > *Visual Acquisition 6*.
5. Click on the *INIT DT-X* button. This will start the GPS feed and allow the unit to interrogate the transducer. A series of tones will sound.
6. A *System Information* window will appear which shows the status of various components. Click OK.

7. Click the *CONFIG DT-X* button.
8. The *Configure Echosounder* window opens.
9. Click the *Load* button and navigate to C: > Biosonics > VisualAcquistion6 > Config > Rockfish_Survey.acqcfg then click OK. This loads a number of parameters so that they don't have to be specified each time. See the list of parameters specified below.
10. Under the *Transducer 1* item in the hierarchical list, select the *Environment* item.
11. Enter the water temperature and salinity collected with the YSI meter, then click the *Compute…* button.
12. Select the *Data Logging* item and change the File Prefix to the current district and the survey day, all separated by an underscore (e.g., NE_Day_6_)
13. Click OK to close the *System Information* window.
14. Click the *START PINGS* button to begin viewing the echogram on the screen (but not record the data), or click *START ALL* to view the echogram AND begin logging the data to hard drive. If you are logging data, note the file name being written to the drive in the lower right-hand corner of the window and write this in the logbook.
15. To stop logging data, click the *CLOSE LOG* button, or to close the log AND stop pinging entirely, click the *END ALL* button.

Loading the Rockfish_Survey.acqcfg Acquisition configuration file sets the following parameters (refers to items in the Configure Echosounder window):

- Transmit/Receive
    - Active Transmission
    - Transmit Pulse Duration (ms): 0.4
    - Start Range (m): 1
    - End Range (m): 70
    - Calibration Correction (dB): 0
    - Data Collection Threshold Level (dB): -80
- Sensors/Mounting
    - All default values used
- Environment
    - Temperature (°C): *Set based on measured value at each station*
    - Fresh Water: No
    - Salinity: *Set based on measured value at each station*
    - Reference Depth (m): 1
    - pH: 7
- Bottom Detection
    - Turned off

- Echo Detection
    - Turned off
- Data Logging
    - File duration(mins): 30
    - File Prefix: Use the survey District_Day_#_ (e.g., NE_Day_3_)
    - File Suffix: leave blank
    - Logging Folder: C:\Biosonics\VisualAcquisition6\data
    - File Cutting Mode: Elapsed Time
    - File Naming Mode: Timestamped
    - Create DT4 Files: Yes
    - Create HAC Files: No
    - Create DTB Files: Yes

IMPORTANT: Make sure the program Visual Acquisition stops pinging before turning off the power to the DT-X surface unit.

With the unit actively pinging, a number of settings can be varied to change the way the data is displayed. These settings can be changed via using function keys or in some cases buttons in the Chart Toolbar.

- Pressing F1 at any time brings up the electronic .pdf Visual Acquisition 6 manual.
- Pressing F3 (or using the toolbar button) increases the display threshold applies a higher (stronger) echo threshold to displayed data, which effectively reduces noise and filters out weaker ping returns. If there is a lot of feed or debris in the water, this can reduce clutter and make fish more apparent. It also “shrinks” the fish echoes and makes them fainter. Note that this only affects the displayed echogram. The actual threshold of the recorded data being logged is set in the System Information window when the system is configured.
- Pressing Shift + F3 (or using the toolbar button) decreases the display threshold does the opposite of decreasing the threshold.

Overview

Welcome to the new Visual Acquisition 6 - real time data acquisition and playback software for BioSonics DT-X Echosounder systems.

This software can be used to acquire data using BioSonics DT-X Echosounder systems. If you own a BioSonics DT-X Echosounder, you will find that the many new features and capabilities of Visual Acquisition 6 will allow you to collect data more efficiently, inspect your survey objectives in the field *before* you return to the office, and help you address any obstacles to correctly collecting the scientifically defensible data that is at the heart of using a BioSonics Echosounder for acoustic measurement. All of this means improvement in the time, cost, and quality of the measurements acquired with your system.

If you do not own or have access to a BioSonics DT-X Echosounder, you can use the software in playback mode to view interesting representative data sets, and explore the characteristic echo signatures from fish, underwater vegetation, various bathymetric topographies, and bottom types. You will also be able to work with existing data sets, and use the associated utilities to import/export BioSonics acoustic data for use with other programs.

Frequently Asked Questions

Visual Acquisition 6 ...

- can run alongside Visual Acquisition 5. It is not necessary to uninstall Visual Acquisition 5.
- has no License Key.
- can be used with a BioSonics DT-X or DE-X Echosounder. It CANNOT be used with any DT, DE, or older echosounder.
- has many new capabilities and improved features. For the best experience, it is recommended that you do not run Visual Acquisition 6 simultaneously with CPU, RAM, graphics, or network intensive applications.[1]
- Includes a set of utilities for working with the various files, formats, and data that it logs.

Section 1. Getting Started

To install the software, visit the Visual Acquisition product webpage on the BioSonics website: http://www.biosonicsinc.com/echosounder-products/software.html and follow the download instructions. Please refer to the Installation Guide under the Help menu for detailed download instructions.

Computer Requirements

Operating System: all version of Microsoft Windows, 2000 or better (2000, XP, Vista, 7).

Prerequisites: Requires .NET Framework 2.0 or greater (the Visual Acquisition Installer will guide you through the .NET download process if the computer you intend to use has not been updated – you must be connected to the Internet to download .NET Framework).

PC Recommended Requirements: 1GB RAM or more (more is better), 120GB hard drive or more (more is better), 1200x800 pixel display resolution or comparable (more is better), a Pentium 4 class chip or better, an Ethernet network connector, a ruggedized ToughBook class computer with a Sunlight Readable Touchscreen display.[2]

Software Requirements: a PDF reader (to view the electronic guides found under the Help menu).

Section 2. Visual Acquisition 6 and your DT-X Echosounder

Overview

Visual Acquisition 6 software has three primary functions:

- To configure and control your BioSonics DT-X Echosounder
- To visualize the data returning from your Echosounder and related sensors
- To log the data in a format that can be played back in a variety of post-processing and data analysis software packages, those from BioSonics as well as third-party software providers.

Designed for Simplicity and a Touchscreen Interface

Visual Acquisition has been designed to be easy-to-use in the field. This means large buttons, a simple, easy to understand interface, and the ability to efficiently access critical functions. If you are using a Panasonic Toughbook ruggedized laptop, or a similar product, you will find that most features of Visual Acquisition 6 have been designed to take advantage of a touchscreen interface.

Front-end of an Echosounder

As the front-end interface to your BioSonics Echosounder, you may think of Visual Acquisition has providing the knobs and dials that you need to be able to configure the Echosounder to collect the data you want, in a manner that is scientifically correct, and will allow you to obtain relevant measurements from post-processing analysis, in a way that is correct and defensible.

Work Flow

Visual Acquisition is organized to reflect the following workflow of acoustic data collection:

1. **Power up** your Echosounder equipment.

2. **Boot** your PC, and run the Visual Acquisition 6 software.

3. Physically **connect** your Echosounder to your PC using an Ethernet cable (or wireless Ethernet connection), turn it on, and wait for the Echosounder to issue the startup beeps to indicate it is ready for connection.

4. **Initialize** the communication connection with your Echosounder ("Initialize DTX")

5. Enter various settings to appropriately **configure** your Echosounder. Alternatively, **load** a previously saved configuration to use.

6. When ready, **start** the echosounder **pinging**.

7. **Inspect** the data streaming from the echosounder in the various **charts** that Visual Acquisition provides. Adjust the charts to get the best view of the elements of the data that you are most interested in measuring.

8. If everything looks good, **start logging** the data.

9. Otherwise, adjust your configuration settings, and **stop** and **start** the echosounder with the new configuration.

10. Once everything is adjusted, **proceed** with your survey, monitoring the echosounder **status lights** in Visual Acquisition 6 to ensure that all systems are working as desired.

Understanding the Visual Acquisition Control Interface

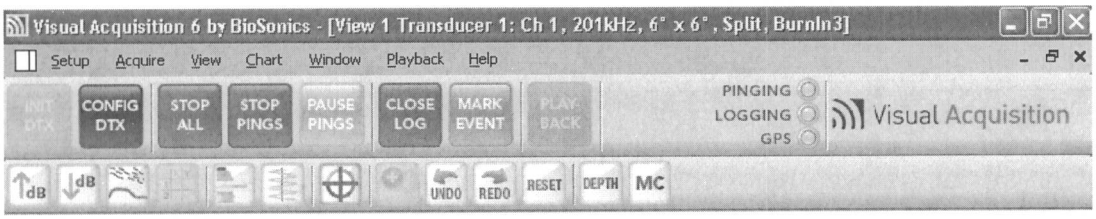
Visual Acquisition 6 has been designed for simplicity and to suit the many users using the Echosounder in a variety of harsh environments.

There are typically 5 ways to accomplish most tasks. Choose the method is most convenient for you and that best matches your equipment and the environmental situation (e.g. bright sunlight, no space for a mouse and/or keyboard, very cold weather so operating with gloves, the availability of a touchscreen, heavy seas with everything pitching and rolling, etc.).

The five control interfaces are:

A. Acquisition Toolbar
B. Chart Toolbar (or Sub-Bar)
C. Main Menu
D. Context Menus (for each Chart)
E. Keyboard Shortcuts

Each control interface is discussed in the sections below.

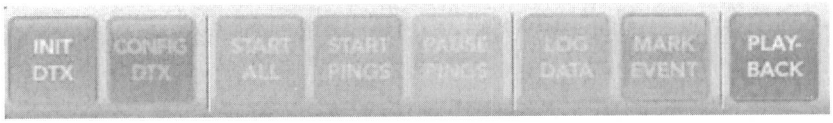


A. Acquisition Toolbar:

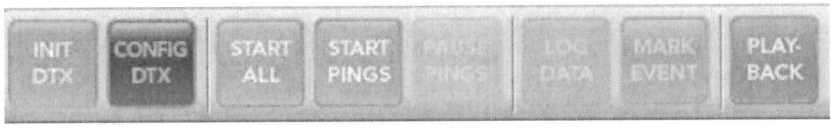
The Acquisition Toolbar contains the eight most frequently used tasks for data collection with your echosounder. The buttons change their appearance based on the state of the echosounder system. This provides a convenient dashboard of controls that guides you through the workflow.

Acquisition Toolbar Appearance. . .

Upon Startup:

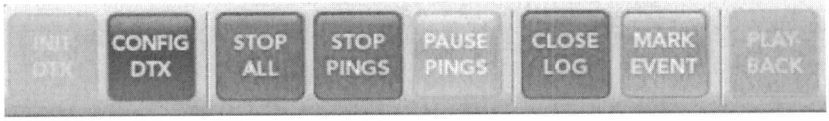


After **INIT DTX**:



After **START PINGS**:

After **LOG DATA**:



INIT DTX: initializes the data and communications connection between your PC and the Echosounder.

CONFIG DTX: brings up a configuration screen with all of the available configuration settings organized for easy reference. The collection of settings can be saved for future loading. The configuration settings are sent to the echosounder with the "Start" command.

START ALL: sends the current configuration settings to the echosounder, instructs it to begin its work accordingly, and instructs Visual Acquisition 6 to log the returning data accordingly.

STOP ALL: instructs the echosounder to stop its activity and Visual Acquisition 6 to close the current data file and cease logging.

START PINGS: sends the current configuration settings to the echosounder, as above, but does NOT automatically start Visual Acquisition 6 logging the returning data.

STOP PINGS: instructs the echosounder to stop its activity. (Any currently open data file will be closed and logging will cease as well).

PAUSE PINGS: instructs the echosounder to PAUSE its activity. Any currently open data file will remain open and logging will continue upon resumption of echosounder activity.

RESUME PINGS: instructs the echosounder to RESUME its activity using the configuration that was sent to the echosounder at Start time.

LOG DATA: instructs Visual Acquisition 6 to begin logging data according to the data logging settings in the configuration that was sent to the echosounder at Start time.

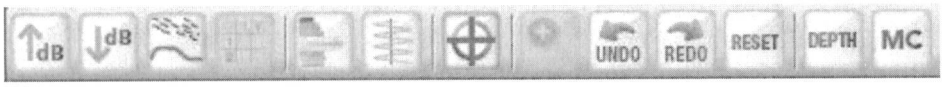
CLOSE LOG: instructs Visual Acquisition 6 to close the currently open log file and to then cease logging data.

MARK EVENT: brings up a screen in which you can type a comment (mark the occurrence of a collection event) that is then stored in the data log and that is marked with the time and location at the moment when you *initiated* the mark.

PLAYBACK: brings up a Browse dialog for you to locate a previously logged data file for review in Visual Acquisition 6.

CLOSE FILE: closes the data file currently being played back in Visual Acquisition 6.

B. Chart Toolbar



The Chart Toolbar contains thirteen commonly used commands for adjusting the charts that display the data streaming back from the Echosounder and associated sensors. The Chart Toolbar, unlike the Acquisition Toolbar, can be turned off if desired.

Some of the Chart Toolbar buttons come in opposing pairs, e.g. 

The remaining Chart Buttons either toggle between one or several states, or perform a specific action.

Moving from left to right:

Increase Display Thresholding: applies a higher (stronger) echo level threshold to the data that is shown on the Visual Acquisition 6 charts. Increasing display thresholding means that you see *less* data on the screen – only the stronger acoustic returns make it past the display threshold filter. Note: This does *not* affect the data that is being logged to disk. The data logging threshold continues to be whatever value was set in the configuration file.

Decrease Display Thresholding: applies a reduced (weaker) echo level threshold to the data that is shown on the Visual Acquisition 6 charts. Decreasing display thresholding means that you see *more* data on the screen – weaker returns make it past the display threshold filter. Note: This does *not* affect the data that is being logged to disk. The data logging threshold continues to be whatever value was set in the configuration file.

SED Echogram and Overlay: toggles between TS or Sv echogram and an SED Echogram (showing only the detected bottom and detected single echoes, provided bottom detection and single echo detection are activated and appropriately configured in the echosounder's configuration). A third toggle state overlays the bottom and single-echoes on top of the TS/Sv echogram.

Echo Summary: provides a quantitative summary of all echoes selected in the rectangle that you have drawn on the echogram. (Requires that you first select echoes on the echogram.)

Oscilloscope Chart: toggles the oscilloscope chart on or off.

Oscilloscope Data Type: toggles the type of data shown in the oscilloscope chart: signal amplitude, x & y angles, x angles only, y angles only.

SED Bullseye Chart: toggles the SED Bullseye chart on or off.

Zoom In: zooms in the chart displays to show the extents selected in the rectangle that you have drawn on the echogram. (Requires that you first select echoes on the echogram.)

Undo: un-does the previous chart action (if applicable). Visual Acquisition 6 maintains an unlimited undo stack.

Redo: re-does a previously undone chart action (if applicable).

Reset Charts: resets charts to default viewing settings.

Depth: brings up a panel showing Bottom Depth and Pitch-Roll compensated Bottom Depth if your echosounder is equipped with the appropriate sensor. Available during data collection only.

MC: brings up the Visual Acquisition 6 message center that contains messages related to the actions that you are trying to perform, and any status or alert messages. If an alert message is available in the message center, a notification icon appears.

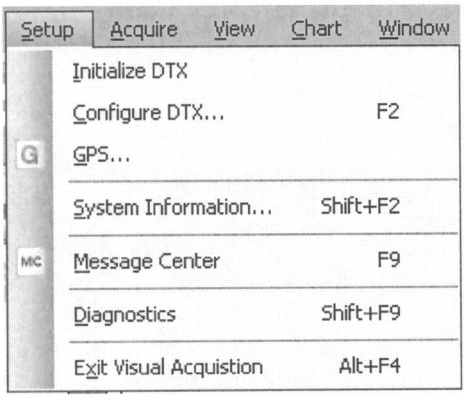
C. Main Menu

Visual Acquisition 6 has a Main Menu consisting of 7 groups of menu commands.

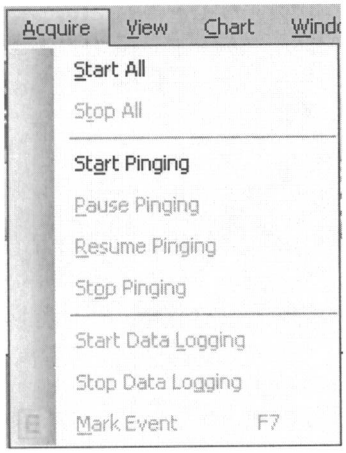
Keyboard shortcuts are indicated to the right of each menu command. Keyboard accelerators (underlined letters) are as shown.

From left to right:

Setup: contains commands to initialize and configure the echosounder (Initialize DTX, Configure DTX) and associated sensors (GPS), to view echosounder properties (System Information), to investigate problems (Diagnostics, Message Center), and to exit the program (Exit Visual Acquisition).



Acquire: contains commands for acquiring data from your echosounder (Start/Stop Pinging, Pause/Resume Pinging), logging the data to disk (Start/Stop Data Logging), and recording text notes into the data stream (Mark Event). Start All is a convenient way to collect and log data with one command.



View: contains commands for displaying bottom depth, marked event listings, and echo summaries; adjusting views displayed within various charts (Display Threshold, Color Sensitivity, Zoom Limits, Undo/Redo/Reset); and navigating through collected data.

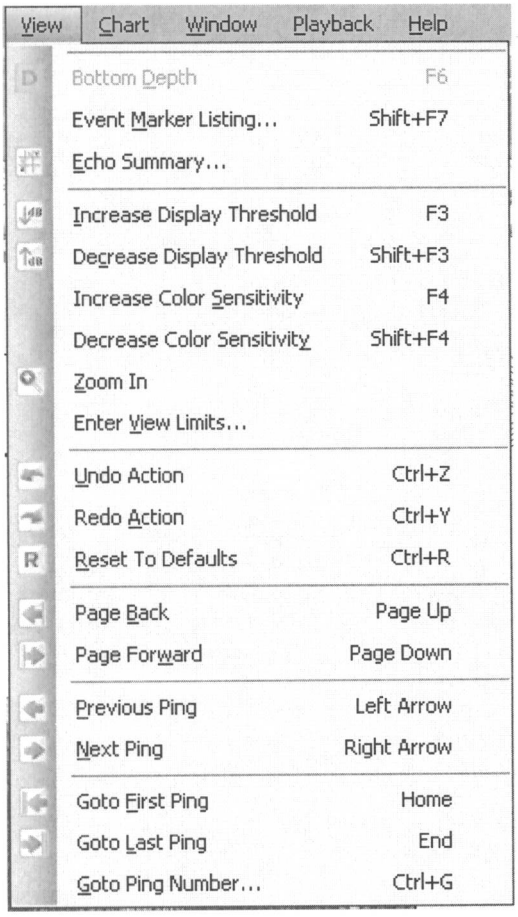
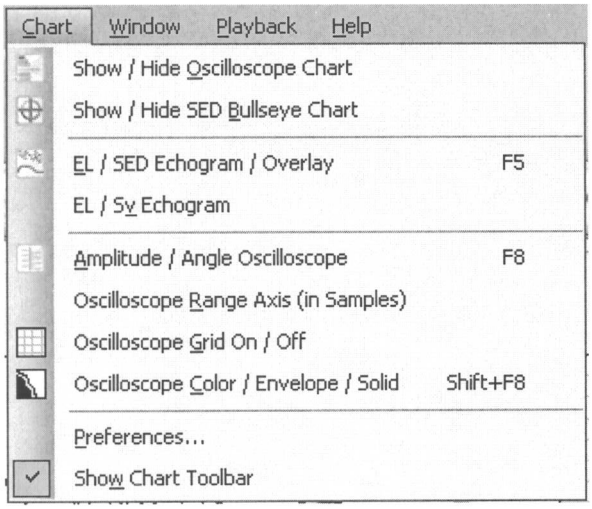
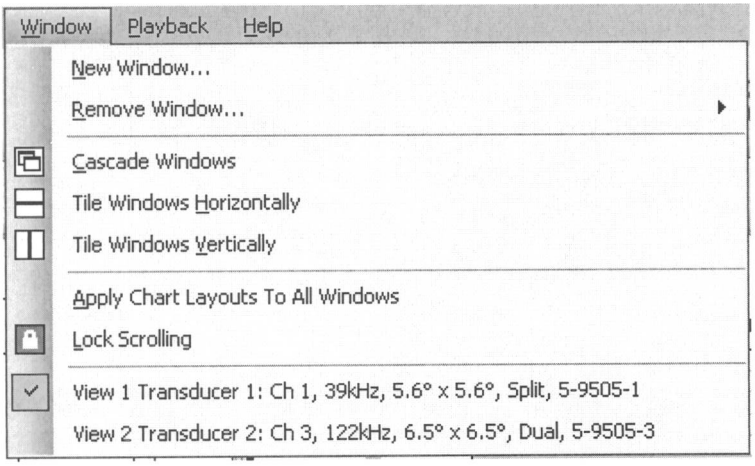


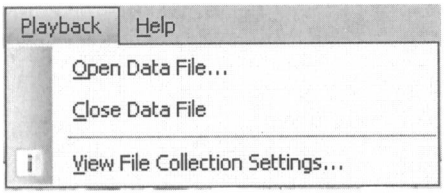
Chart: contains commands for showing / hiding various charts (Oscilloscope, SED Bullseye), and configuring displayed charts (Echogram configuration commands, oscilloscope configuration commands, chart display preferences). The Chart Toolbar can be optionally hidden (uncheck the Show Chart Toolbar command).



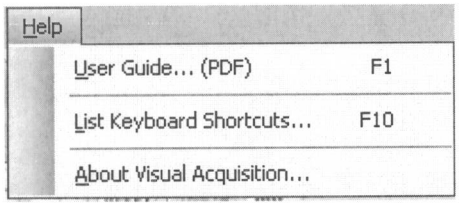
Window: contains commands for adding or removing windows to allowing viewing data from multiple transducers or to add additional charts for viewing data from the same transducer (New Window, Remove Window). Windows can be arranged in a cascading fashion or be tiled horizontally or vertically (Cascade Windows, Tile Windows Horizontally, Tile Windows Vertically). For convenience, chart layouts from one window can be applied to all other windows (Apply Chart Layouts to All Windows). Also for convenience, charts in all windows can be locked so that scrolling data within one window automatically scrolls in all windows (Lock Scrolling).



Playback: contains commands for opening and closing already collected data files (Open Data File, Close Data File), and for viewing the settings at which they were collected (View File Collection Settings).



Help: contains commands for loading the available PDF guides (Installation Guide, the Quick Tour, and User Guide), displaying the list of keyboard shortcuts (List Keyboard Shortcuts), and displaying information about Visual Acquisition 6, including the version number (About Visual Acquisition).

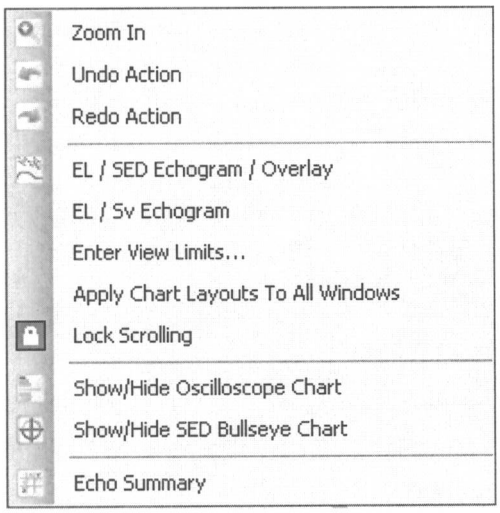


D. Chart (Context) Menus

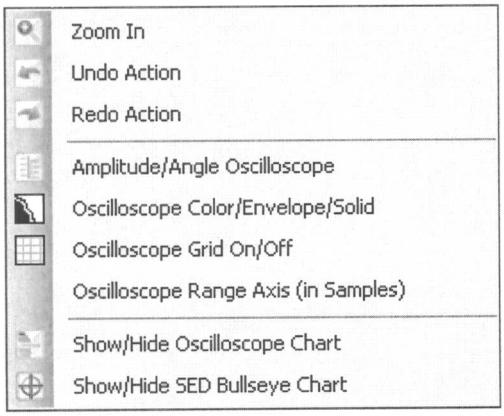
Each of the three primary charts, Echogram, Oscilloscope, and SED Bullseye, has an associated context menu that can be activated by Right-Clicking the mouse within the chart area.

The commands in each Context Menu perform the same function as named command in the Main Menu, but are placed in the Context Menu for easy access.

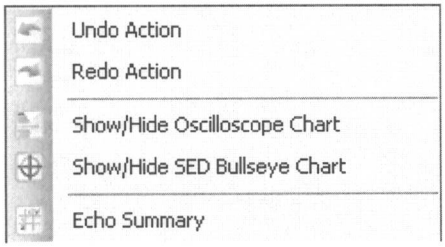
Echogram Context Menu: contains commands desirable for easy access when working within the echogram chart.



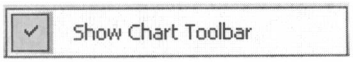
Oscilloscope Chart Context Menu: contains commands desirable for easy access when working within the oscilloscope chart.



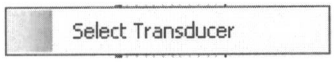
SED Bullseye Context Menu: contains commands desirable for easy access when working with the Bullseye chart.

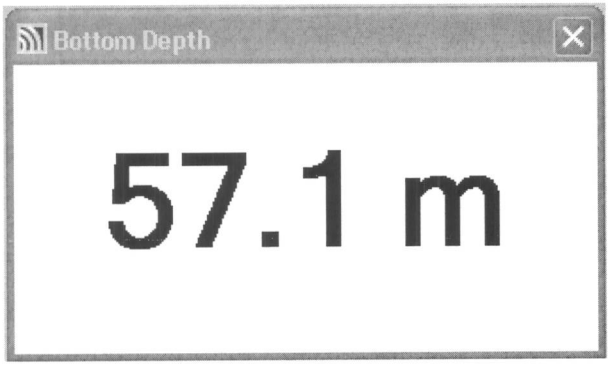


Toolbar Context Menu: allows optionally hiding the Chart Toolbar (small buttons) by un-checking the Show Chart Toolbar command.



Bottom Depth Context Menu: allows selecting the transducer whose bottom depth measurement is displayed in the Bottom Depth Display.





E. Keyboard Shortcuts in Visual Acquisition 6

Keyboard shortcuts are keys that you can press to perform commands in a "one-touch" manner. Use these to make navigation and control quick and easy when it is convenient to use a keyboard.

Function Keys

F1	Loads User Guide (PDF)
F2	Brings up configuration settings (CONFIG DTX)
Shift+F2	Brings up echosounder system information
F3	Increases display thresholding
Shift+F3	Decreases display thresholding
F4	Increases color contrast (sensitivity)
Shift+F4	Decreases color contrast (sensitivity)
F5	Toggles between SED Echogram, EL+ SED Overlay, or EL Echogram
F6	Displays Bottom Depth Display
F7	Marks event
Shift+F7	Brings up Mark List Viewer
F8	Toggles between oscilloscope data types (amplitude or phase data)
Shift+F8	Toggles the signal envelope of the oscilloscope between colored, outline, or solid
F9	Brings up Message Center
Shift+F9	Brings up Diagnostics
F10	Displays List of Keyboard Shortcuts

Data File Navigation (in Playback)

Right Arrow	Next Ping (advances current ping by 1 ping)
Left Arrow	Previous Ping (backs up current ping pointer by 1 ping)
Page Down	Page Forward (moves current ping pointer ahead by one "page" of the selected echogram, or to the end of the current echogram view, if it is not already at the right-most ping of the view.)
Page Up	Page Back (moves current ping pointer back by one "page" of the selected echogram, or to the beginning of the current echogram view, if it is not already at the left-most ping of the view.)
End	Goto Last Ping (moves current ping pointer to the last ping in the echogram.)
Home	Goto First Ping (moves current ping pointer to the first ping in the file.)
Ctrl+G	Goto Selected Ping (brings up a dialog box for user to enter the ping number to go to.)
Up Arrow	Scroll Up (shifts echogram view upward in range)
Down Arrow	Scroll Down (shifts echogram view downward in range)

Mapped Keys

Ctrl+R	Reset Charts to Default Settings (in currently selected Window)
Ctrl+Z	Undo Action
Ctrl+Y	Redo Action

Standard Windows Shortcuts

Alt+F4	Exit Visual Acquisition
Ctrl+Tab	Toggle between multiple Windows (if applicable)
Ctrl+Space or Alt+Space	Pull down system menu

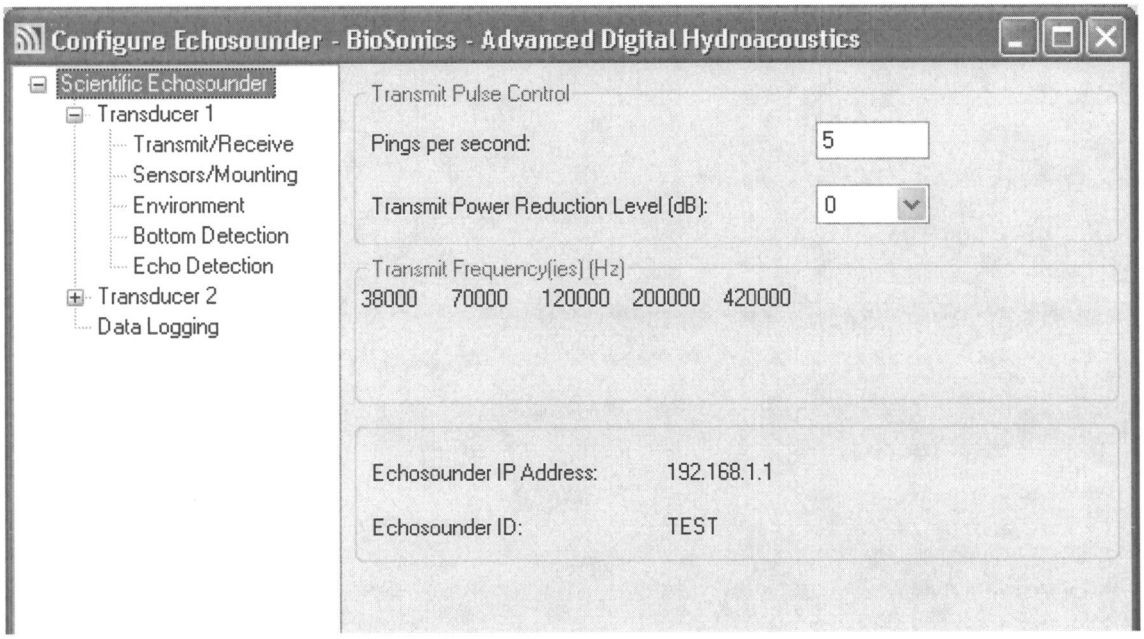
Keyboard Accelerators

All menu commands can use the standard accelerator methods of Windows software. Specifically, each menu on the Menu Bar contains an accelerator key indicated by an underline symbol (if you have configured your Windows to show accelerators). For example, you can access the Setup menu using Alt+S. When the menu drops down, you will see that you can access the Configure DTX... command by pressing the "c" key.

Section 3. Configuring Visual Acquisition 6 and your DT-X Echosounder

This section describes each of the settings available in the Configuration Settings of Visual Acquisition 6.

Echosounder Settings shows you the properties of your Scientific Echosounder, the number of Transducers you have attached (in this case two), and allows you to set the Ping Rate for the Echosounder system (in this case 5 pings per second *per transducer).* It also allows you to choose between High and Low (-10dB) transmit power.



Pings per second: sets the ping rate (per transducer) that the echosounder will attempt to achieve. You can see the actual ping rate achieved (per transducer) in the Window status bar.

Transmit Power Reduction Level: two choices: standard power (0dB reduction) or low power (typically –10dB reduction).

Transmit Frequency(ies): displays the transmit frequencies that your DT-X echosounder can emit. The transmit frequency is selected (from among the programmed frequencies in the echosounder) to match the frequency of each transducer.

Echosounder IP Address: the IP address of your echosounder system.

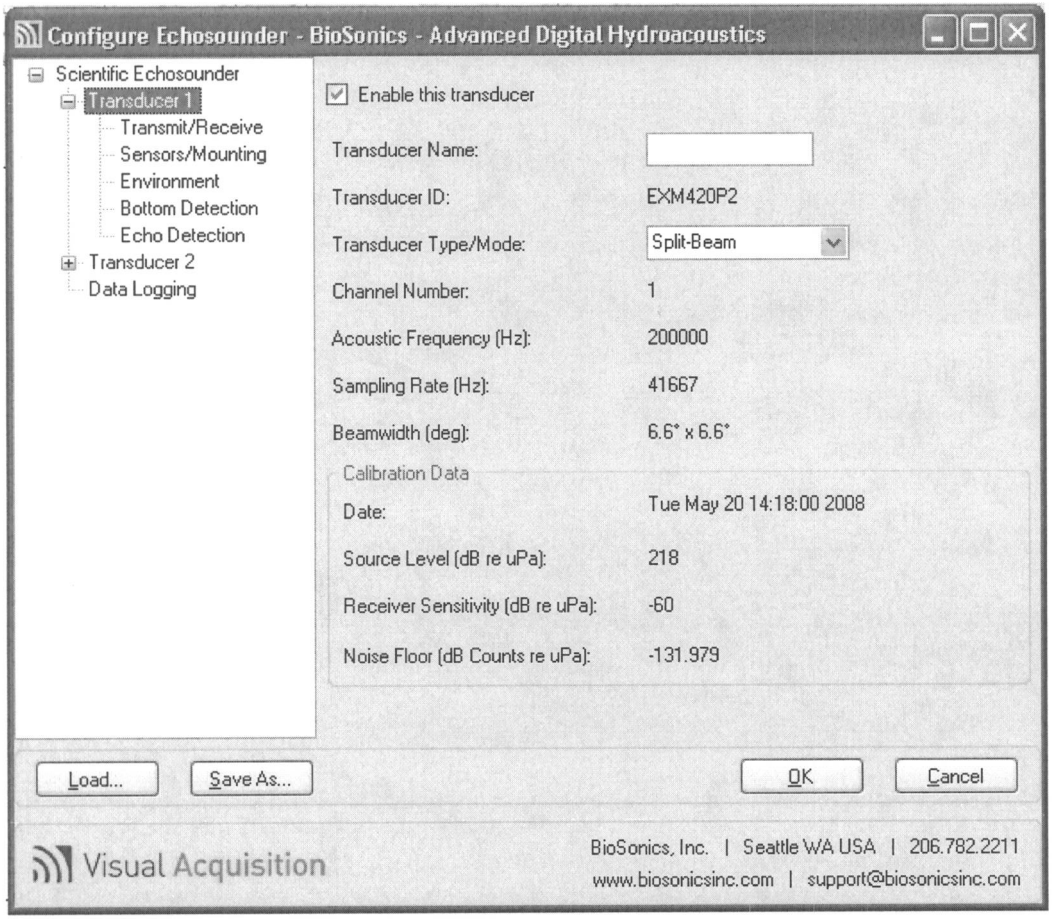
Echosounder ID: an identifier programmed into your echosounder system.

Loading and Saving configurations can be useful.

Load: allows you to select a stored echosounder configuration.

Save As: allows you to save the current configuration to file for later use.

Transducer Settings allows you to enable or disable a particular transducer, set a nickname for your transducer, and review its properties and calibration information.



Enable this transducer: uncheck this box to *remove* the selected transducer from the multiplexing cycle (if you have two or more transducers attached to your echosounder).

Transducer Name: a "nickname" you may enter to make it easier to identify the charts showing the data returning from that transducer. This phrase will be shown in the title bar of the window displaying data from the associated transducer.

Transducer ID: an identifier programmed into your transducer.

Transducer Type / Mode: the default setting indicates whether your transducer is a split-beam or a single-beam transducer. If it is a split-beam transducer, you may optionally run the transducer in single-beam mode.

Channel Number: the communication address of the transducer. Note: you may not have two transducers with the same address connected to the echosounder.

Acoustic Frequency: the transmit frequency of the transducer. This is selected at manufacturing time to provide your transducer with optimal performance characteristics. Note: this frequency must be programmed into your echosounder in order for you to obtain quality data.

Sampling Rate: the digital sampling rate of the envelope of the signal.

Beamwidth: the beamwidth of the transducer, measured at the –3dB point of the transducer beam pattern. For circular transducers, the two numbers will be identical. For elliptical transducers, the two numbers will be different (beamwidth of major and minor axis).

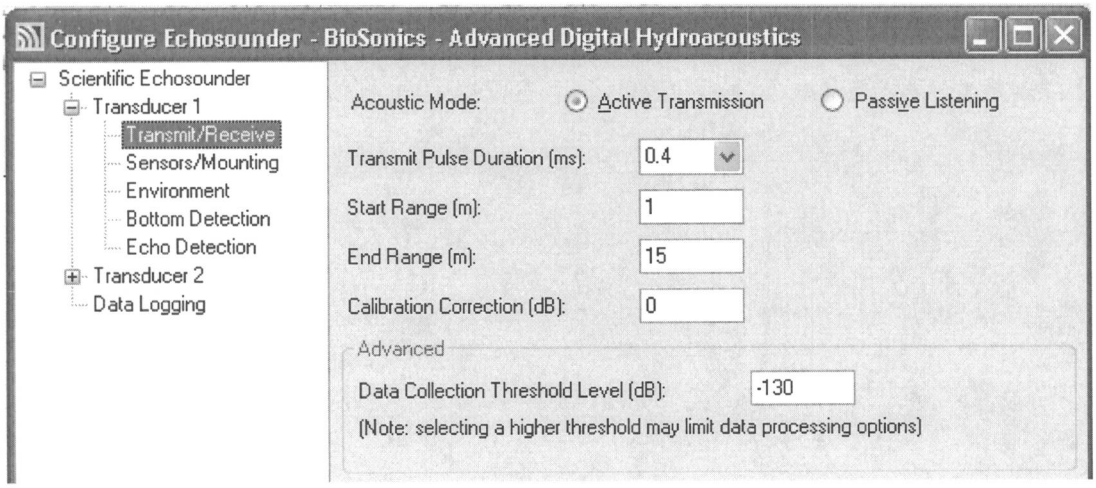
Calibration Date: date of last *change* to your calibration.

Source Level: the source level of your transducer

Receiver Sensitivity: the receiver sensitivity of your transducer

Noise Floor: the electronic sensitivity of your transducer.

Transmit / Receive Settings is where you configure the collection parameters for your echosounder: user selectable start and end ranges, transmit pulse duration, calibration correction offset value, and data collection threshold level.



Acoustic Mode: two choices: Active Transmission emits energy into the water with each ping. Passive Listening places the echosounder into listening only mode – no energy is emitted into the water.

Transmit Pulse Duration: ten choices, from 0.1ms to 1.0ms. Defaults at 0.4ms.

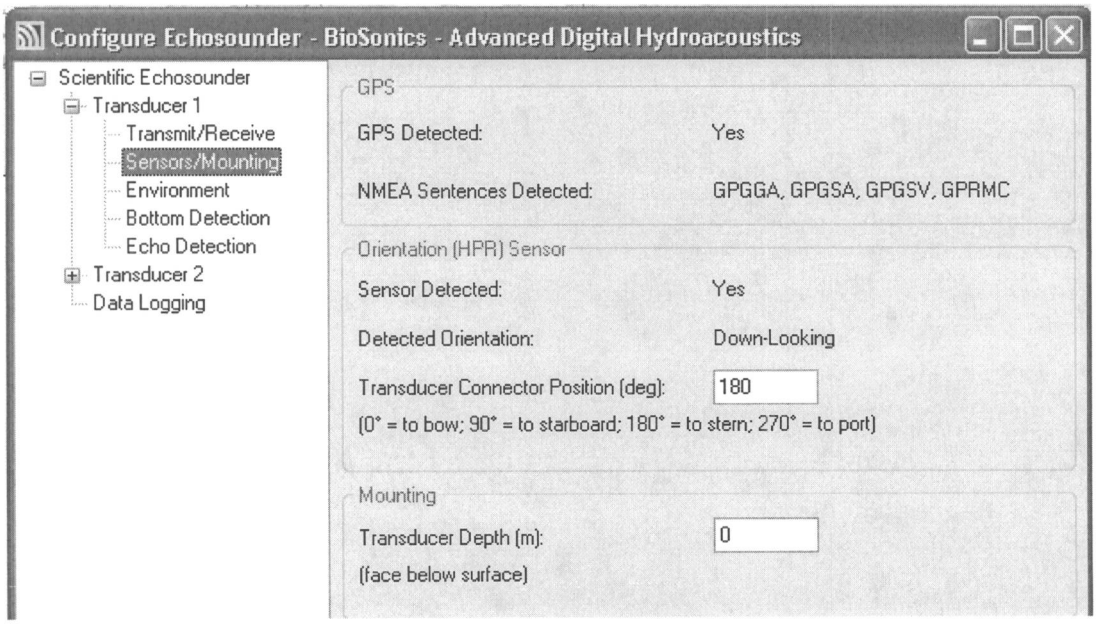
Start Range: the range in meters (from the transducer face) at which data collection begins.

End Range: the range in meters (from the transducer face) at which data collection ends. Note: Your selection of end range affects maximum achievable ping rate, based on the two-way travel time of sound.

Calibration Correction: an offset obtained during field calibration for adjusting data collection according to in-situ calibration results. (See Advanced Topics)

Data Collection Threshold Level: specifies the minimum echo level that should be recorded in the data file. No data truncation is –130dB (the default), which is typically the noise floor of a BioSonics transducer. Selecting a higher threshold truncates the recorded data. Note: truncating data at collection time is irreversible. Care should be taken to ensure that all of the analysis post-processing algorithms will be applicable at the data collection threshold level you have selected. If you are unsure, leave the data collection threshold at the default.
(See Advanced Topics)

Sensors / Mounting Settings allow you to view optional sensors that may be attached to your Scientific Echosounder, e.g. GPS and Orientation Sensor, as well as specify various details about your transducer deployment.



GPS Detected: (automatic) Yes, if NMEA sentences are detected containing recognized position information. No if no NMEA sentences are detected that contain position information that Visual Acquisition 6 recognizes.

NMEA Sentences Detected: (automatic) Displays the NMEA sentences detected from the GPS or NMEA device connected to the DT-X Echosounder.

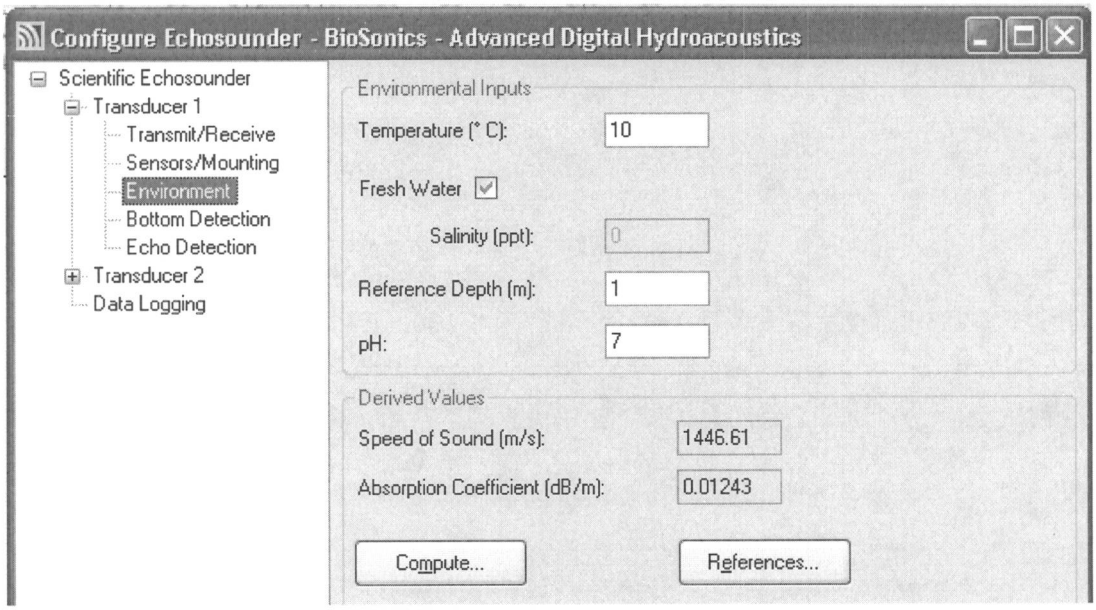
Orientation (HPR) Sensor Detected: (automatic) Yes if an integrated Orientation (HPR) Sensor is detected in the associated transducer. No otherwise.

Detected Orientation: (automatically detected *at INIT DTX time*) Down-looking, if the Orientation Sensor shows a Pitch that is greater than 45 degrees above/below horizontal. Side-looking, if the Orientation Sensor shows a Pitch that is less than 45 degrees above/below horizontal.

Transducer Connector Position: (only available if transducer is in Down-looking orientation). Enter the position of the (side) connector of your transducer. Use a standard compass-type coordinate system, but think of the bow of your boat as 0 degrees, the starboard direction as 90 degrees, and the port direction as 270 degrees. In this coordinate system, indicate which direction the (side) connector of your transducer is pointing.

Transducer Depth: specify the depth of the transducer face.

Environment Settings allow you to specify the environmental measurements at your deployment site. Visual Acquisition 6 uses these to compute sound speed and absorption coefficient.



Temperature: specify the water temperature (at the selected reference depth).

Fresh Water: uncheck this if working in seawater or in water with a high mineral content.

Salinity: specify the salinity of the water in parts-per-thousand (ppt), or the equivalent salinity if a high mineral content.

Reference Depth: specify the depth at which the previous measurements are taken.

pH: specify the acidity/alkaline measurement of the aquatic environment in which the acoustic measurements are to be made.

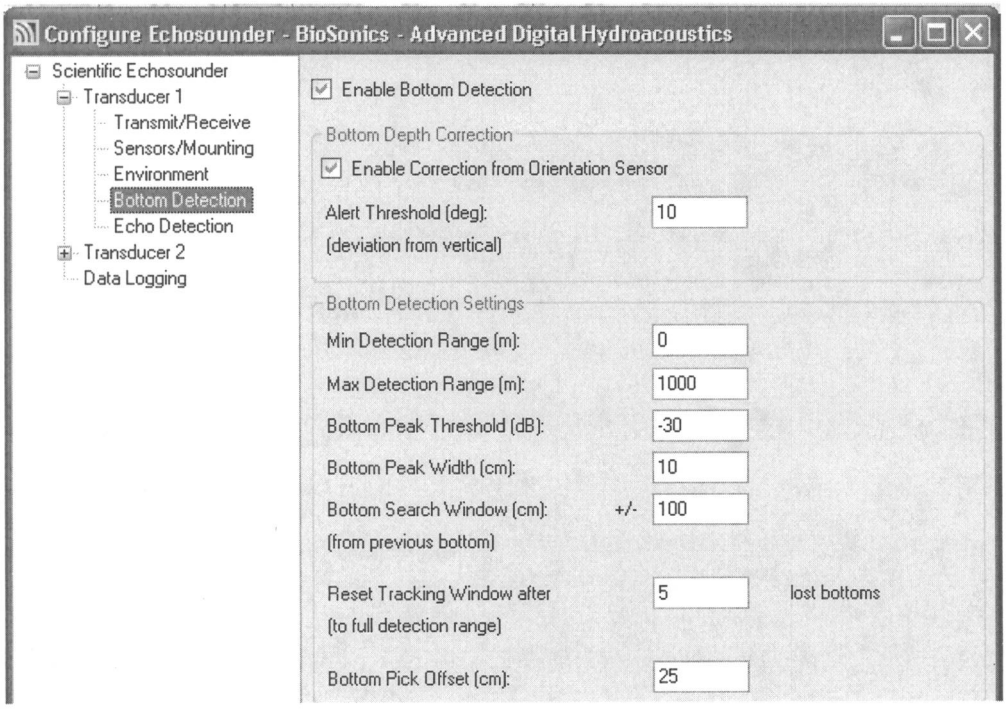
Speed of Sound: computed from the environmental inputs above.

Absorption Coefficient: computed from the environmental inputs above.

Compute: displays the computed values of Speed of Sound and Absorption Coefficient.

References: displays the algorithms used and journal references for the computations of Speed of Sound and Absorption Coefficient.

Bottom Detection Settings determine the performance of the real-time bottom detection algorithm that Visual Acquisition 6 uses. You may select which of your transducers you wish to use to determine the bottom depth. If you have an Orientation Sensor integrated into your transducer, you may enable Orientation-Corrected Bottom Depth.



Enable Bottom Detection: check this to enable bottom detection and the bottom depth display. By default, this is checked when transducer is in down-looking mode, and unchecked when transducer is in side-looking mode.

Enable Correction from Orientation Sensor: check this to enable real-time bottom depth correction. By default, this is checked when transducer has an orientation sensor *and* is in down-looking mode; it is disabled when either the transducer does *not* have an orientation sensor, *or*, when it is in side-looking mode. (See Advanced Topics.)

Alert Threshold: specify an angular deviation from vertical to be used as an alert threshold. The bottom depth display will turn red when the orientation sensor indicates that the transducer's orientation has deviated from vertical by more than the alert amount. Default is 10.

Min Detection Range / Max Detection Range: range within which a valid bottom detection must occur.

Bottom Peak Threshold: the echo level that must be surpassed in order for an echo to be considered a candidate bottom echo. Default is –30dB.

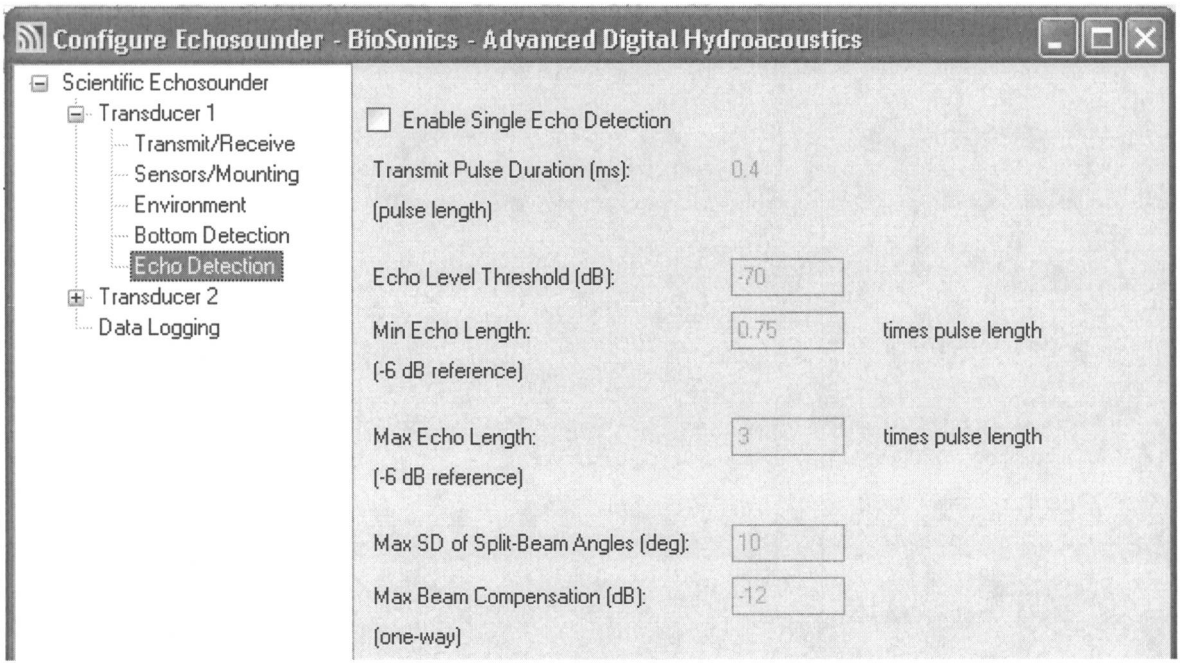
Bottom Peak Width: the "width" (also called length, or duration) that the bottom echo must surpass in order to continue as a candidate bottom echo. Default is 10 cm.

Bottom Search Window: the length of the range window, centered about the range of the most recently located bottom, within which the current candidate bottom echo must appear, in order for it to be chosen as the bottom echo. Default is +/- 100 cm.

Reset Search Window: the number of "lost bottoms" before resetting the Bottom Search Window to the full Min/Max Bottom Detection Range. Default is 5 lost bottoms.

Bottom Pick Offset: the distance above the bottom echo at which to place the bottom pick. Default is 25 cm.

Echo Detection Settings determine the performance of the real-time Single Echo Detection (SED) algorithm that Visual Acquisition 6 uses. You can enable or disable single-echo detection on any of your transducers. The parameters on this page are discussed in more detail in the User Guide.



Enable Single Echo Detection: check this to enable single echo detection on the data from your transducer. Default is unchecked.

Transmit Pulse Duration (also called "pulse length" or "pulse width"): this is for reference only. To change this, go to the Transmit/Receive Settings.

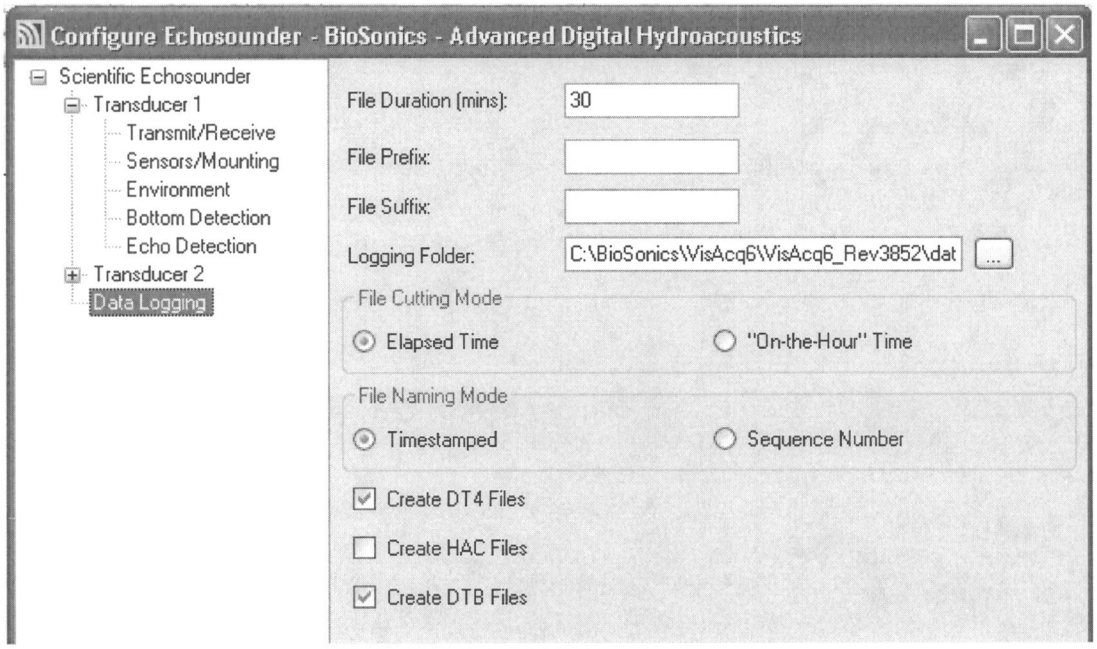
Echo Level Threshold: the minimum strength that an echo must surpass in order to be a candidate single-echo.

Min / Max Echo Length: the minimum / maximum length interval (also called "width" or "duration") that a candidate echo must fall within in order to continue as a candidate echo. Note: echo length is measured as a factor of the transmit pulse length, and is measured at the –6dB reference level.

Max SD of Split-Beam Angles: the maximum standard deviation (variance squared) of the split-beam phase angles of the digital samples constituting the envelope of the candidate echo. Both X and Y phase angles are referred to this single value.

Max Beam Compensation: the maximum one-way compensation allowed (due to position in the beam) for a candidate echo to be selected as a valid single-echo.

Data Logging Settings is where you configure the data logging options of your Echosounder. You may select the file duration, the method of automatic file naming (timestamped or sequential file names). Optionally, you may specify a file prefix or suffix, and choose the folder (directory) into which you wish Visual Acquisition 6 to record the streaming acoustic and sensor data from the Echosounder. You may select to create DT4 files for use with all BioSonics analysis software packages as well as many third-party analysis software packages, range-to-bottom (DTB) files for use with BioSonics Visual Analyzer, and HAC output for use with additional third-party analysis software packages.



File Duration: the maximum duration that Visual Acquisition will allow a data file to continuing being written before automatically starting a new file.

File Cutting Mode: two choices: Elapsed Time (default) or "On-the-Hour" Time. Elapsed Time means that the File Duration timer begins when the first log file is created. All automatically created data files will be of the same duration. "On-the-Hour" Time refers instructs Visual Acquisition to use the PC System Time to determine the File Duration to ensure that data file boundaries occur "On-the-Hour". (See Advanced Topics).

File Naming Mode: two choices: Timestamped (default) or Sequence Number. Timestamped means that Visual Acquisition will create logged data files with filenames consisting of the year, month, day, hour, minute, second, and time zone. Sequence Number uses automatically generated sequence numbering.

File Prefix / Suffix: These are optional phrases that Visual Acquisition 6 will prepend or append to the data file name.
Create DT4 data files: when checked (default), this instructs Visual Acquisition 6 to create data files in the DT4 file format for use with BioSonics and many third-party acoustic data analysis packages.

Create HAC data files: when checked, this instructs Visual Acquisition 6 to create data files in the ICES HAC file format (International Council for the Exploration of the Seas)

Create DTB bottom files: when checked (default if bottom detection is enabled), this instructs Visual Acquisition 6 to create bottom edit files ready to import into the BioSonics Visual Analyzer software package.

Endnotes

[1] The following classes of applications are known to be CPU, RAM, graphics, disk, or network intensive applications, and, for best user experience, should typically not be actively running alongside Visual Acquisition 6 when collecting data.

Network Telephony applications (such as Skype) – network intensive.
Firefox 3.0 browser, or earlier, with many tabs – RAM intensive.
CAD programs – graphics intensive.
Batch processing, large batches of number crunching, complete virus scanning – CPU intensive.
Disk defragmentation – disk access intensive.

These, or similar types of applications, can degrade your Visual Acquisition 6 experience if run simultaneously with a data collection survey.

[2] BioSonics recommends the ruggedized Panasonic ToughBook Computer for the ultimate in reliable performance in outdoor conditions. BioSonics is an authorized reseller of Panasonic ToughBook Computers.

APPENDIX B. UNDERWATER VIDEO SYSTEM

Underwater video cameras are used to record images of schools of rockfish in order to identify what species are present, and in what numbers. Outlined below are assembly instructions and usage guidelines for the components of the camera, light, and digital recording system for collecting underwater video. When used in conjunction with the hydroacoustic electronics, these components can put a significant demand on the vessel's electrical supply. Make sure there is sufficient amperage available through quality sine-wave inverters or auxiliary power before leaving the harbor.

Cameras, lights, and housing

The cameras are housed in a rigid plastic trawl float along with a pair of LED lights, and these are attached to the end of a cable (Figure B1.1) which suspends the camera in the water column and transmits the data to the surface. The cable bundle has a fairing sheath consisting of many short streamers that reduces drag through the water by encouraging laminar water flow past the cable. The trawl float separates into two hemispheres held together by four ¼" bolts (Figure B1.1). The support bracket for the cameras and lights is attached to the lower hemisphere of the housing, and the harness attaching the housing to the cable is attached to the upper hemisphere. The lights bolt directly to the support bracket and the cameras are held in place using a pair of stainless exhaust hose clamps. The housing itself is suspended from the surface cable using a braided line harness. It is safe to lift the system using the main cable where the fairing streamers are attached, and there is an aluminum pipe handle across the top of the housing for lifting the housing itself. ***Never lift the housing using the black data cables below the braided harness lines.***

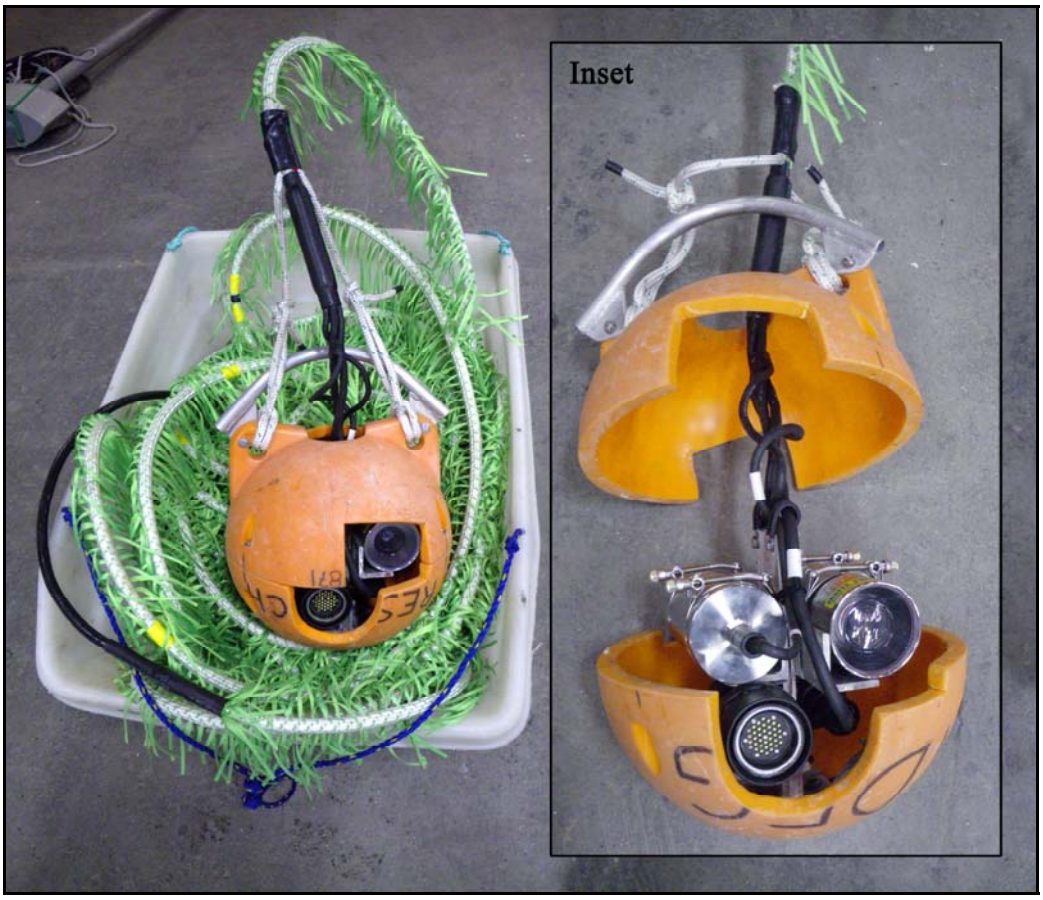


Figure B1.1.–Underwater video cameras, lights, housing, and cable.

It should not be necessary to disassemble the trawl float housing camera system while underway. Giving the camera housing a fresh water rinse occasionally should be sufficient until the survey is over and the system gets disassembled into its component parts for storage. When removing the plugs from either the lights or camera ***it is important not to pull on the cable*** as this will break the solder at the wire/pin junction. The plug itself should be held firmly and pulled out of the accessory with a gentle rocking motion. When installing underwater plugs it is useful to lubricate the contact pins and holes with a small amount of silicone dielectric grease. The connector sleeve which screws the two plug halves together simply keeps the plug from separating and does not contribute to the waterproofing of the plug. Making it finger tight is sufficient.

Surface Video and Light Control Box

The surface end of the able attaches to the face of the camera control box (Figure B1.2) via a 14-pin military-style connector. Near the input cable connection are two RCA-style output video feeds, one for each camera. In the upper right-hand corner of the face plate is the 110v power input cable, a fuse, and the main power switch for the system. The lower portion of the control box face plate is split roughly into two halves, each side of which controls one camera and light set. A rheostat knob is used as a dimmer for the LED lights. A control override switch is present to enable or disable the use of the focus and zoom features of the cameras.

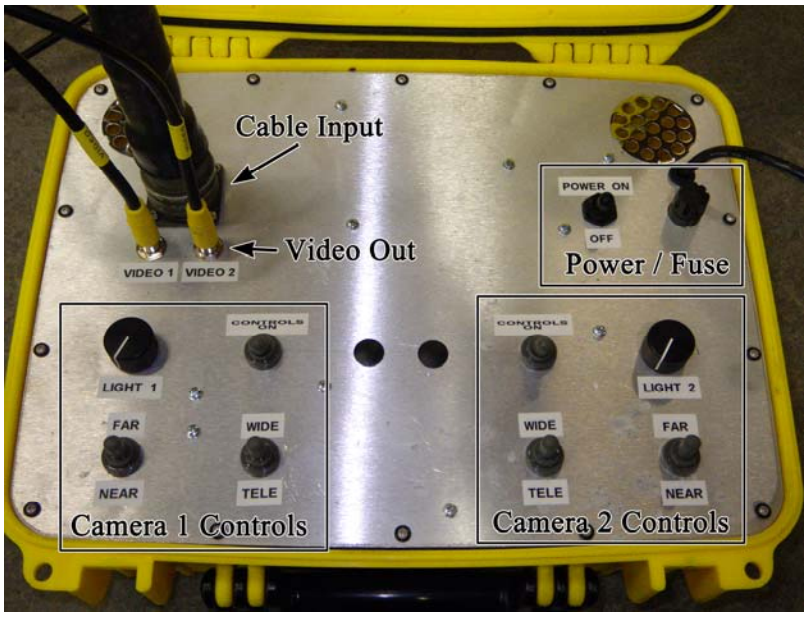


Figure B1.2.–Underwater video camera and light control box.

Recording Underwater Video to MiniDV

The RCA video output plugs for video 1 and 2 should be connected to the ¼" composite video input ports on a pair of Sony Walkman MiniDV digital video recorders (DVR), respectively. This first set of DVRs (hereafter called a "pass-through DVRs") are used to apply a time and date stamp to the video feed, and then pass this video feed to a second set of DVRs (hereafter called a "record DVRs") which actually records the video and time stamp to a MiniDV tape. Each camera has two DVRs dedicated to it: the pass-through DVR for adding the date and time stamp, and the record DVR to record the composite footage to tape. In both parallel systems, an S-video cable connects the output from the pass-through DVR to the input of the record DVR. The record DVR will have an RCA-style output plug feeding the composite video image to a deck monitor where the technician can see the video feed in real time and control the camera accordingly. A schematic diagram of the system is shown in Figure B1.3.

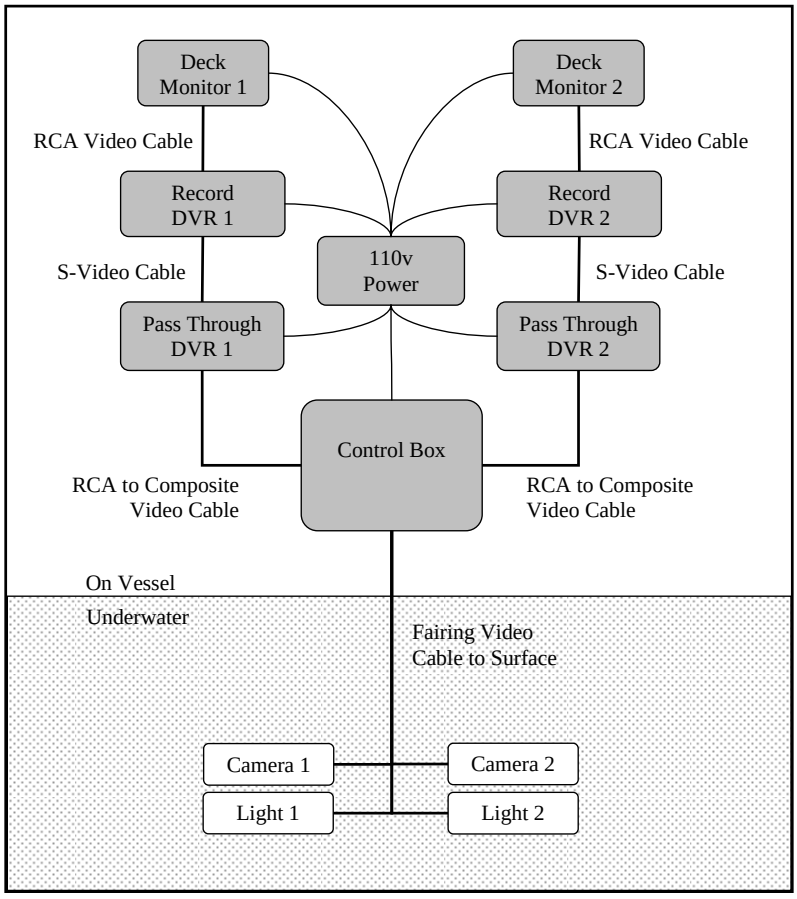


Figure B1.3.–Wiring schematic for underwater video recording system components.

Housing all the cables and DVRs in a single, large plastic storage container will reduce clutter and help protect the sensitive video units (Figure B1.4).

The pass-through Walkman will have a MiniDV tape inserted and it will enter “record” mode at the same time as the final Walkman doing the actual recording, but the pass-through Walkman’s tape will be rewound and rerecorded each time the Record Walkman’s tape becomes full and is exchanged. An infra red remote control is used to simultaneously start and stop recording on all DVRs so that the tapes and time stamps remain synchronized.

The technician setting up the DVRs should ensure that the recorders have the correct time and date set. To set the time and date, make sure the Walkman is plugged into a power source, and then turn it on. The date and time will briefly appear in the lower margin of the LCD screen. In order to change the date/time settings, press the *Menu* button just below the power switch. To the right of the Menu button is a jog wheel that can be rolled in order to change the menu selection, and depressed to execute the selection. Roll the jog wheel so that the sixth menu item is highlighted (it looks like a toolbox), and press the jog wheel. A sub-menu will become highlighted called *Clock Set*. Press the jog wheel again and the year will become highlighted. Scroll the jog wheel until the correct date is shown, then press the jog wheel. The date and time are set consecutively in the same manner. Once the date and time are correct, press the *Menu* button to exit the settings.

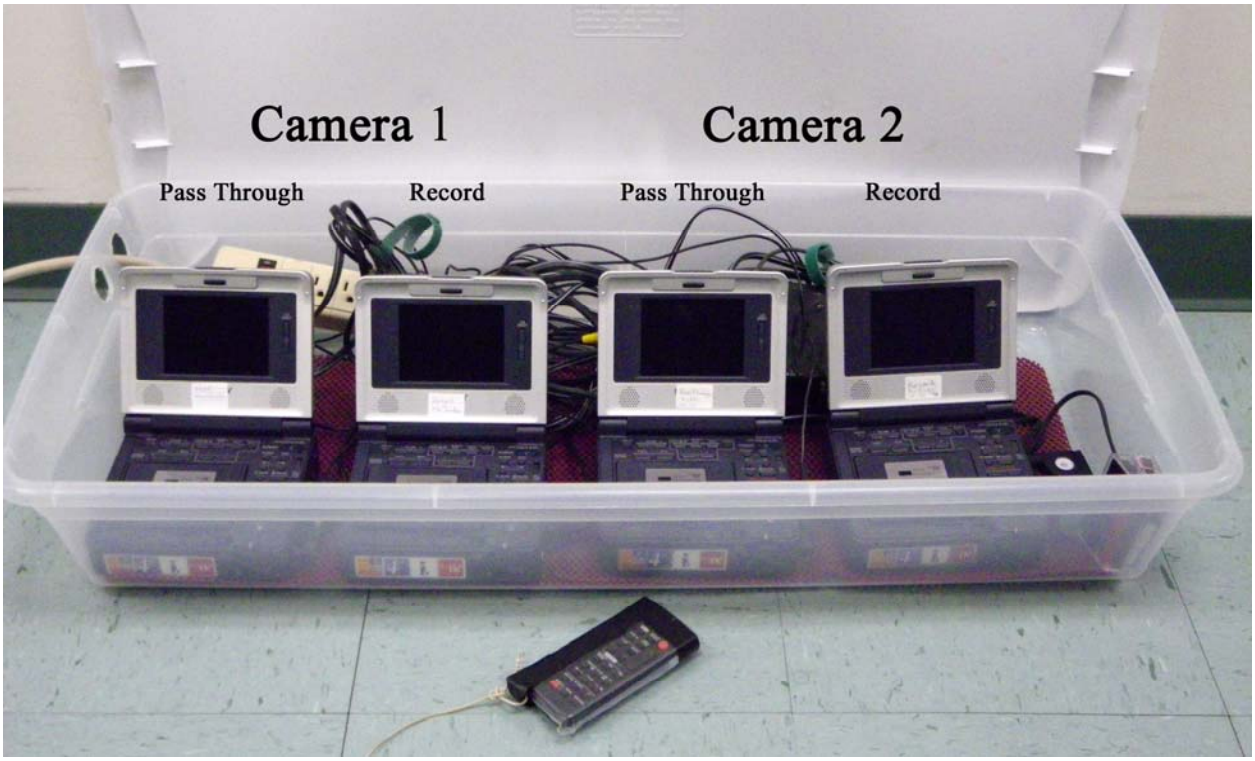


Figure B1.4.–Digital video recorders used to record underwater video.

The technician should ask the vessel operator the depth in fathoms before lowering the camera system over the side of the boat. The cable is lowered by hand over the side of the vessel and generally held by hand during deployment. The camera operator can compensate for wave-induced vessel movement to stabilize the camera's picture, and can turn the cameras in a desired direction by twisting (i.e., rotating axially) the cable at the surface. If the cable needs to be left unattended, it can be clamped in a cam cleat mounted on the rail of the vessel (Figure B1.5). Colored plastic tape fathom markings are placed on the camera cable in 1-fathom (2 m) increments, and the tape color changes every 5 fathoms. Depth measurements are in fathoms for easier comparison with a standard vessel's electronics. Yellow tape is used from 0 to 5 fathoms, red from 6 to 10 fathoms, blue from 11 to 15 fathoms, green from 16 to 20 fathoms, and black/white from 21 to 25 fathoms.

Figure B1.5.–Cam cleat for holding underwater video camera cable.

When deploying the camera, pay out sufficient cable to allow the camera housing to sink to within one fathom of the sea floor, but not contact it. Once fish are seen on one of the deck monitors, the camera operator can press the record buttons on the remote control and begin recording on all the DVRs. All the relevant data to the beginning of the drift should be entered on the video log form (Figure 7). The Index No. column will be left blank during the survey and is only used when entering the information in a database. The date, survey station, and nearest headland should be entered for every drift with the camera. The clock time columns are for entering the time of day in an a.m./p.m. format. GPS waypoints for the beginning and end of each drift should be recorded in the appropriate columns. The tape number along with the beginning and ending tape time counter should be recorded on the video log form as well as the average drift depth and any related comments.

APPENDIX C. AUTOMATIC FISHING SYSTEM

Appendix C1.–Instructions for operating an Oilwind 03-16 electronic jig machine.

OILWIND

FULLY AUTOMATIC ELECTRIC JIGGING REEL

TYPE: 03-16

USER`S MANUAL

Sellers Guaranty:

Guaranty:
The guaranty covers the Electric Computerised Jigging Machine OILWIND type 03-16. The Seller will provide a 24 months guarantee from date of purchase (stated below), covering the product's mechanical functions, as described in this Users Manual.

Condition:
Guarantee work, during the guarantee period, must only be carried out by the Seller's own service specialists, or by a service specialist appointed by the Seller. For parts, repaired or replaced, during the guarantee period, the Seller provides the same guarantee as above.
It is the Owner's responsibility to cover the transport costs, if any.
The Seller takes no responsibility, if the product is damaged or faulty due to transport, handling, lack of regular maintenance, wrong installation and/or connecting or if the Owner has made any alternations or changes of the original product, or has been using the product to any purpose, apart from jig fishery.
The Seller can neither accept any responsibility for any damage or fault caused by bad weather or any other nature reason.
It is the Buyers responsibility to maintain the product and to repair and replace parts to the operational wear and tear.

The Sellers responsibility starts from: _____

Date, signature and stamp

TYPE: _____

SERIAL NO.: _____

PART NO.: _____

YEAR: _____

KEYPAD NO.: _____

TABLE OF CONTENTS:

Summary of the Operation

The Jigging Machine is electrically driven and the fishing functions are computer controlled.

The operation of the machine is simple:

Switch-on the machine, press the (DOWN) button. The line pays out until the sinker reach the bottom, and the Machine starts fishing.

The Machine is programmed with all fishing functions pre-set, ready to start fishing (please see instruction regarding adjusting the weight, page 14).

Above mentioned standard program is for bottom fishing. Fig. 10 on page 25 shows the nature of this fishery.

The standard program can be adjusted to your requirements. Adjustments can be saved for future use as your own program, but you can always return to the original standard program.

The computer is inside the box on top of the machine. On the computer box is the keypad with:

Display, showing the computers different values, adjustments and information to the user

Also there are 10 buttons for adjusting and controlling the machine, and a whistle giving information to the user by sounds.

Before starting, winding new line onto the reel:

After winding the main line onto the reel, fasten a nylon ring on the end. The hook set-up will be fastened to the same nylon ring. The ring will act as a "stopper" when it hits the roller on the end of the arm (see Fig.1). When the main line is on the reel and the "stopper" has hit the roller, "clear" the machine, by pressing the CL (CLEAR) button for 5 seconds (there will appear a long sound).

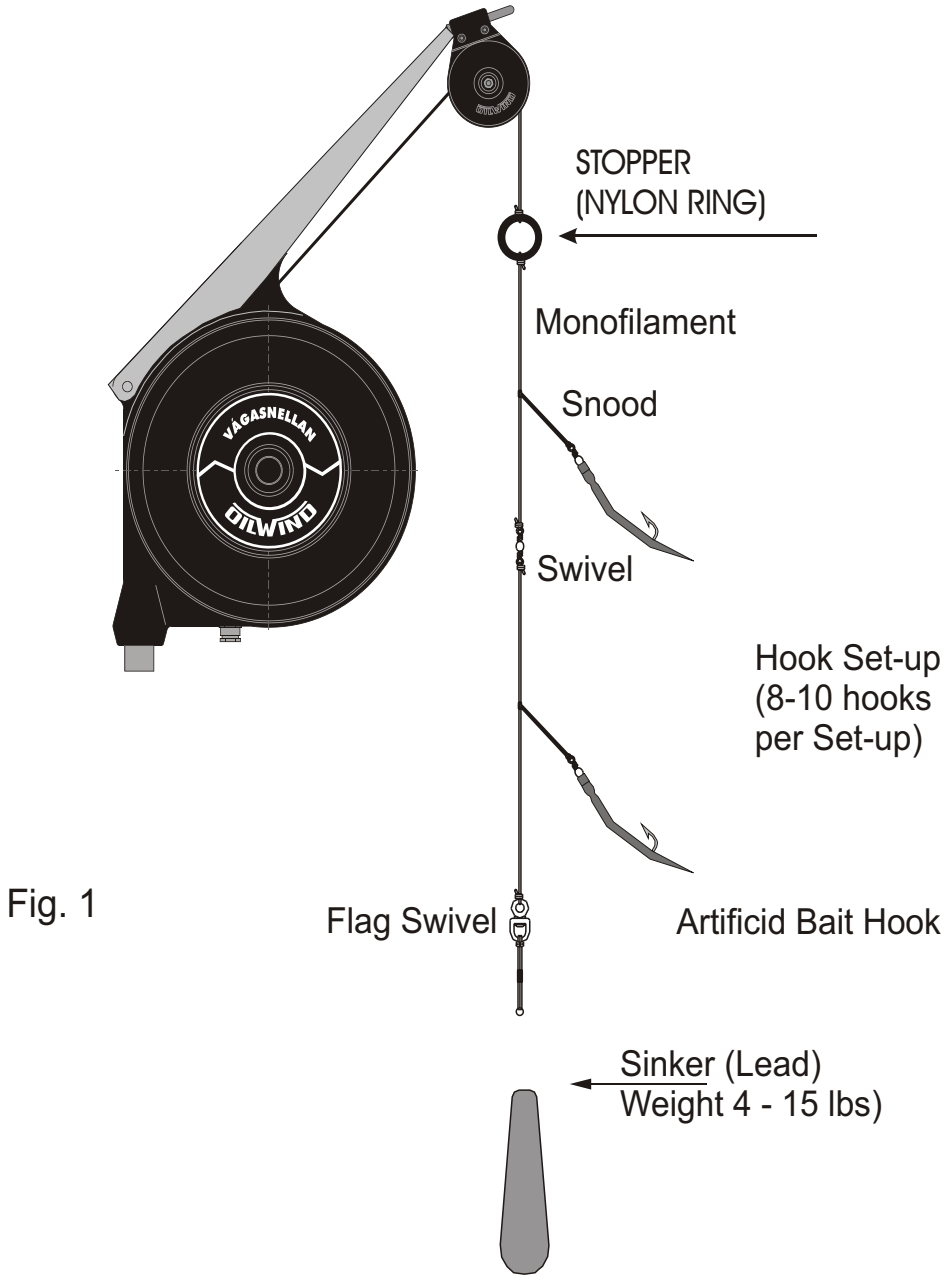


Fig. 1

THE COMPUTER:

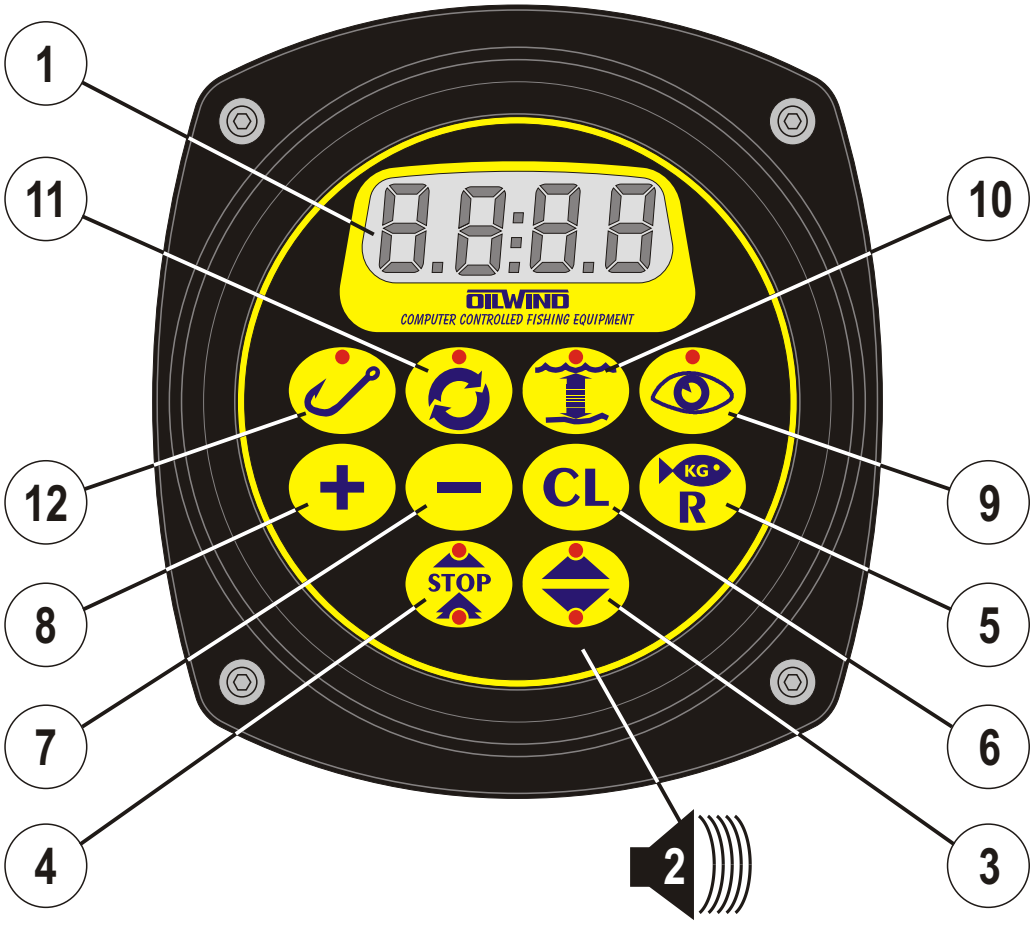


Fig. 2

1. DISPLAY
2. WHISTLE
3. DOWN
4. STOP - UP - DOWN
5. WEIGHT / DEPTH
6. CLEAR
7. MINUS
8. PLUS
9. SEARCH
10. ADJUST DEPTH
11. ADJUST MOTOR FUNCTIONS
12. ADJUST JIGGING FUNCTIONS

DESCRIPTION OF THE FUNCTIONS:

1. DISPLAY 

The display shows the following:

The Depth (how many fathoms of line paid out), as well as the value of the function you have selected.

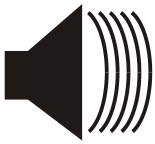
In addition it shows the following special events:

: (colon) When in searching mode.

F (and depth) When hauling with fish on the hook

A (and depth) When fouled and hauling

C (and depth) When hauling for drift compensation.
It will haul the fishing line up and stops for checking the gear.

2. WHISTLE 

The Whistle will sound:

3 long sounds when fish has taken the hook or touched it.

3 short sounds when the gear is 5 fathoms from the gunwale.

1 long sound when the CL (CLEAR) button is pressed for 5 seconds, and the machine return to the standard program.

3. DOWN

When the (DOWN) button is pressed the line is payed out. In this button there are two lights, one is lighting when the line is payed out, and the other when the line is hauled in.

4. STOP - UP - DOWN

This key has got three functions:

1) The first time you press the button (STOP - UP - DOWN), the wheel will stop.

2) The second time you press the button (STOP - UP - DOWN), the machin will haul the line up (using Speed 2)

3) The third time you press the button (STOP - UP - DOWN), the machine will pay the line out (using Speed 2)

This button has no direct connection with the program, and its function gives you the ability to operate the machine manually. You do have the opportunity to stop and start the wheel, independent of the computer program.

The (STOP - UP - DOWN) button switches off the fishing program.

To return to the fishing program, press the (DOWN) button.

5. WEIGHT / DEPHT

This key has got two functions:

1) Keep the (WEIGHT / DEPTH) button pressed during fishing operation, and the display shows the weight on the line.

2) When you have adjusted motor- and jig functions, the display will show the Depth again by pressing (WEIGHT / DEPTH) once.

6. CLEAR

This button has got two functions, to be used during "Adjust Motor" and "Adjust Jig":

1) Press the button CL (CLEAR) once - **the actual value** of the individual function adjusted, returns to the value in the standard programme.

2) Keep the button CL (CLEAR) pressed for five seconds (the whistle will give 1 long sound) - **all functions** will return to the values in the standard programme.

Apart from the above mentioned functions, the button is used to Clear the ADJUST DEPHT ( ) function (please see Adjust Depth on page 10).

7. MINUS

Press the button to reduce the value you want to adjust.

8. PLUS

Press the button to increase the value you want to adjust.

9. SEARCH

The Search function has got the following two options:

1) Searching for fish from the bottom:

Press the (SEARCH) button (the light starts flashing) and then press the (DOWN). The display shows a . (colon), and the (SEARCH) botton lights. The Machine will start to search for fish from the bottom and upwards. The Search mode operates per the current jig numbers and jig travel values and will move the line upwards until it has reached the value adjusted as "Search Range". Then the machine will pay-out the line to the bottom, and repeat the searching (please see further instructions in "Jig Functions", 7. "Search Range"). In the Standard Program the value of the Search Range" is 40, the machine will search up to 40 fathoms from the bottom or the starting point of search. This can be adjusted as to your own requirements.

To stop searching, just press the (SEARCH) button and then the (DOWN).

2) Searching for fish from a pre-set depth:

Press the (ADJUST DEPTH) button (the light start flashing), and then adjust your depth by using the (PLUS) or (MINUS) buttons, Then press the (SEARCH) button followed by the (DOWN) button, and the machine will pay-out the line to the pre-set depth and starts searching (from adjusted depth to adjusted Search Range).

To stop searching, just press the buttons as follows: (ADJUST DEPTH), CL (CLEAR), (SEARCH), and (DOWN).

10. ADJUST DEPTH

This button has got two functions:

1) The machine can be adjusted to fish at a certain depth.

Press the (ADJUST DEPTH) button and adjust the preferred depth with the (PLUS) or (MINUS) button. Press the (DOWN) button and the machine starts fishing at the pre-set depth (the buttons light is on as the machine is fishing at the pre-set depth).

To stop fishing from the pre-set depth, just press the buttons as follows: (ADJUST DEPTH), CL (CLEAR) and (DOWN).

2) The machine can find the depth where the last fish was caught.

If the machine has caught a fish midwater, the machine will register the depth, and you can start fishing at this depth by:

Press the (ADJUST DEPTH) botton (the light will start flashing) and the display will show the depth where the last fish was caught.

Then press the (DOWN) button, and the machine will pay out the line to the depth where he latest fish was caught, and start fishing (the button light is on).

To stop fishing from the pre-set depth, just press the buttons as follows: (ADJUST DEPTH), CL (CLEAR) and (DOWN).

THE (ADJUST MOTOR) AND (ADJUST JIG) MODES DO HAVE SEVERAL SUB-FUNCTIONS.

The functions are listed on top of the machine (fig. 3) with a number and name for the different sub-functions for (ADJUST MOTOR) and (ADJUST JIG). To select a function, press the button as many times as necessary to reach the desired function.

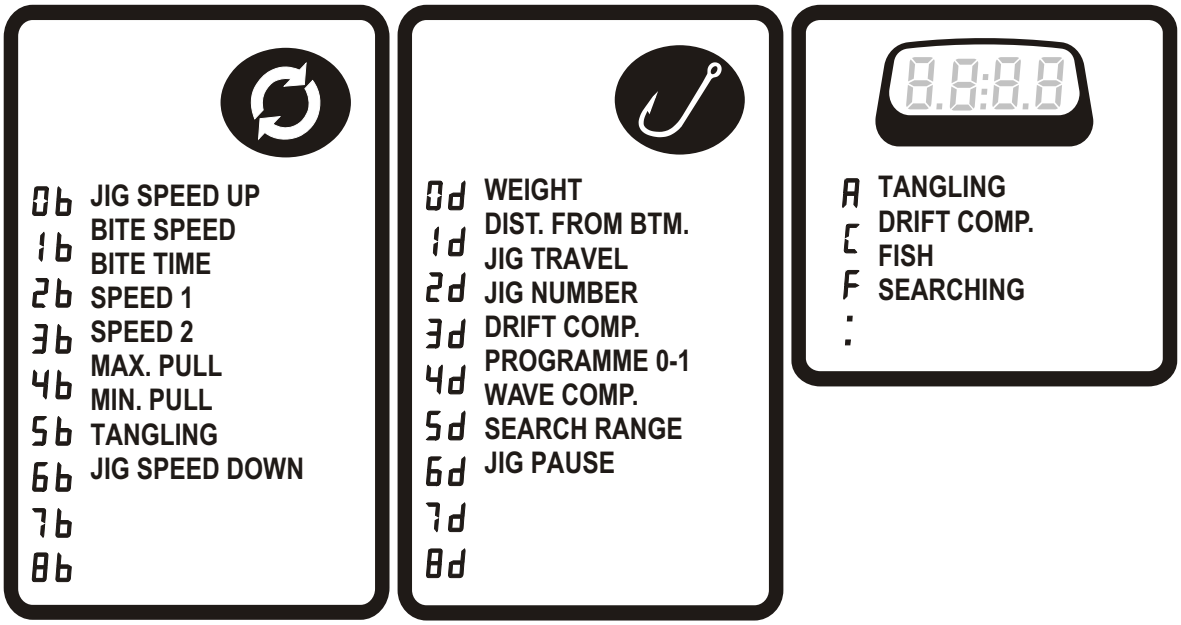


Fig. 3

The value of the functions can then be adjusted by the (PLUS), (MINUS) or CL (CLEAR) buttons.

When the ADJUST MOTOR or ADJUST Jig modes are activated, the button light is on and while the adjustments are made, the light will flash.

11. ADJUST MOTOR:

Adjusting the MOTOR functions:

Examples of adjusting 0b JIG SPEED

Press the (ADJUST MOTOR) button. Press as many times as necessary to get the display to show 0b and a value (the button light is on). Adjust the value with the (PLUS) , (MINUS) or CL (CLEAR) button (the light starts flashing). To get the adjustment accepted, press again the (ADJUST MOTOR). The light stops flashing.

To activate the new program press the (DOWN) button.

By pressing the (WEIGHT - DEPTH) button, the display shows the depth again (the (ADJUST MOTOR) button light is off).

0: JIG SPEED UP

The display shows: 0b and a figure.
This figure shows the adjusted Jig Speed when the line is hauled (when in jigging mode). The figure is the percentage of the maximum possible Jig Speed.

1: BITE SPEED

The display shows: 1b and a figure.
This figure shows the adjusted Bite Speed. The Bite Speed is the hauling speed the first moment after a fish is caught. Bite Speed is used during the Bite Time. The figure is the percentage of the maximum possible Bite Speed.

2: BITE TIME

The display shows: 2b and a figure.
This figure shows the adjusted Bite Time. The Bite Time is the period the Bite Speed shall last. The value is in seconds.

3: SPEED 1

The display shows: 3b and a figure.
This figure shows the adjusted Speed 1, or revulutions per minute. The Speed 1 is the hauling speed after the Bite Time. The figure is the percentage of the maximum possible speed the machine will be hauling at. The value is the percentage of the maximum possible revolutions per minute..

4: SPEED 2

The display shows: 4b **and a figure.**
This figure is the programmed speed 2, it is revolutions per minute (rpm). Speed 2 is used when activating the STOP (STOP-UP-DOWN) button. The figure is a percentage of maximum rpm.

5: MAXIMUM PULLING POWER.

The display shows: 5b **and a figure.**
This figure is the percentage of maximum possible pulling power the machine is pulling at, when pulling with maximum force.

6: MINIMUM PULLING POWER.

The display shows: 6b **and a figure.**
This figure is the percentage of maximum possible pulling power the machine is pulling at, when pulling with minimum force.
When the machine is sensing the first bite, it starts pulling at Minimum Pulling Power. As the machine is sensing additional bites, it will auto-matically increase the Pulling Power and adjust the speed. This results in a minimising of power consumption, and the pull and speed will increase until the machine has reached the programmed values for MAXIMUM PULLING POWER and SPEED 1.

7: TANGLING

The display shows: 7b **and a figure.**
This function is used to adjust the machine's sensitivity for registration of tangling of the fishing gear. The pre-set value is 4,5. A lower value means more sensitive and a higher value the opposite. This value is not required to be adjusted under normal conditions.

8: JIG SPEED DOWN

The display shows: 8b and a figure.
This figure shows the adjusted Jig Speed when the line is payed out (when in jigging mode). The figure is the percentage of the maximum possible Jig Speed.

12. ADJUST JIGGING FUNCTIONS

Adjusting the JIG functions:

Examples of adjusting Od WEIGHT

Press the (ADJUST JIG) button. Press as many times as necessary to get the display to show Od **and a value** (the button light is on). Adjust the value with the (PLUS), (MINUS) or CL (CLEAR) button (the button light will start flashing). To get the adjustment accepted, press again the (ADJUST JIG) The button light will stop flashing.

By pressing the (WEIGHT - DEPTH). button, the display shows the depth again (the (ADJUST JIG) button light is off).

0: WEIGHT

The displays shows: Od **and a figure.**
This figure is the limit (weight) to cross, for the mode to sense a bite and start reel in the line.

Guidance to adjust the weight.
Adjusting the limit (weight) is essential for the way the machine is sensing fish - a low value means a more sensitive registration (smaller weight of fish will be registered) and a high value means a less sensitive registration (larger weight of fish will be registered).

Adjusting the limit (weight) is also essential for compensation of the weight of the gear (line, hooks, sinker), as the weight of the gear will vary depending of depth and weather conditions.

Guidance to adjust for gear compensation.

The line and gear has to be in the water without fish on the hooks, then press the (WEIGHT - DEPTH) button. The display shows then the weight of the line and gear.

Then adjust the limit (weight) Od (see above), based on the weight of the line and gear. The weight shall be adjusted to a weight higher than the weight of the line and gear, depending on how sensitive you choose the machine to be.

1: HEIGHT FROM BOTTOM

The display shows: 1d **and a figure.**
This figure is the distance from the bottom (in fathoms) the machine will haul the gear before commence jigging.

2: JIG TRAVEL

The display shows: 2d **and a figure.**
This value is the jig travel in fathoms.

3: JIG NUMBER

The display shows: 3d **and a figure.**
This figure is the number of times the reel jig before searching for the bottom again.

4: DRIFT COMPENSATION

The display shows: 4d **and a figure**
Depending on tide and weather conditions, the line can angle away from the fishing boat. This can affect the efficiency of the fishing. To compensate for this, the machine has the function DRIFT COMPENSATION. The figure indicates the number of jigs before the machine is hauling the gear to the gunwale. To be adjusted to the weather conditions. Use a lower value in bad weather and current conditions. This function also is for controlling the gear, and if there should be fish on the hooks, not registered by the machine.

5: PROGRAMME 0-1

The display shows: 5d **and a figure.**
This figure can adjusted as 0 or 1.
If the figure is adjusted to 0 (standard), the machine will operate as described before as to the standard program. If the figure is adjusted to 1, the machine will fish without any stops. The machine will pay out the line, and haul up again to the gunwale immediately. Here it stops for some seconds, and will repeat the operation.
This fishing method is used for e.g. squid and mackerel fishing.

6: WAVE COMPENSATION

The display shows: 6d **and a figure.**
The standard figure for Wave Compensation is 0, and in normal conditions it is not necessary to adjust this figure. If the vessel has heavy moves in rough sea, the machine may falsely sense the sinker has touched the bottom, so the value may need to be adjusted. If the vessel is rolling faster than the line is payed out, the machine will sense it as the sinker has touched the bottom, and will start fishing before the sinker has reached the bottom. Under these conditions, the WAVE COMPENSATION should be increased.

7: SEARCH RANGE

The display shows: 7d **and a figure.**
This figure indicates how many fathoms from the surface, or pre-set depth, the machine is adjusted to commence search (see the  (SEARCH) button on page 9).

8: JIG PAUSE

The display showes 7d **and a figure.**
This figure indicates in seconds the pause between jigging period.

DEFAULT VALUES IN THE STANDARD PROGRAM:

MOTOR-FUNCTIONS:

	Standard Value:	Range:
0 JIG SPEED UP	30 % of max. RPM.	10 - 99
1 BITE SPEED	20 % of max. RPM.	10 - 99
2 BITE TIME	15 sconds	00 - 99
3 SPEED 1	75 % of max. RPM.	10 - 99
4 SPEED 2	99 % of max. RPM.	10 - 99
5 MAX. PULLING POWER	40 % of max. Power	10 - 99
6 MIN. PULLING POWER	27 % of max. Power	10 - 99
7 TANGLING	4.5	3.0 - 7.0
8 JIG SPEED DOWN	90 % of max. RPM	10 - 99

JIG-FUNCTIONS:

	Standard Value:	Range:
0 WEIGHT	45	10 - 99
1 HIGHT FROM BOTTOM	1.0 fathoms	0.0 - 9.9
2 JIG TRAVEL	2.0 fathoms	0.2 - 9.9
3 JIG NUMBER	05	01 - 99
4 DRIFT COMPENSATION	40	01 - 99
5 PROGRAMME 0-1	00	00 or 01
6 WAVE COMPENSATION	00	00 - 06
7 SEARCH RANGE	40 fathoms	05 - 99
8 JIG PAUSE	00 seconds	00 - 99

MOUNTING ONBOARD THE VESSEL:

Since no two fishing vessels are laid out the same, the machine is built to be adapted to individual requirements. The machine is fitted with a taper shaft end (see fig. 4 below). This shaft end can then be welded to any mounting bracket suitable to the individual vessel's conditions.
(On page 33 there are some examples of mounting brackets)

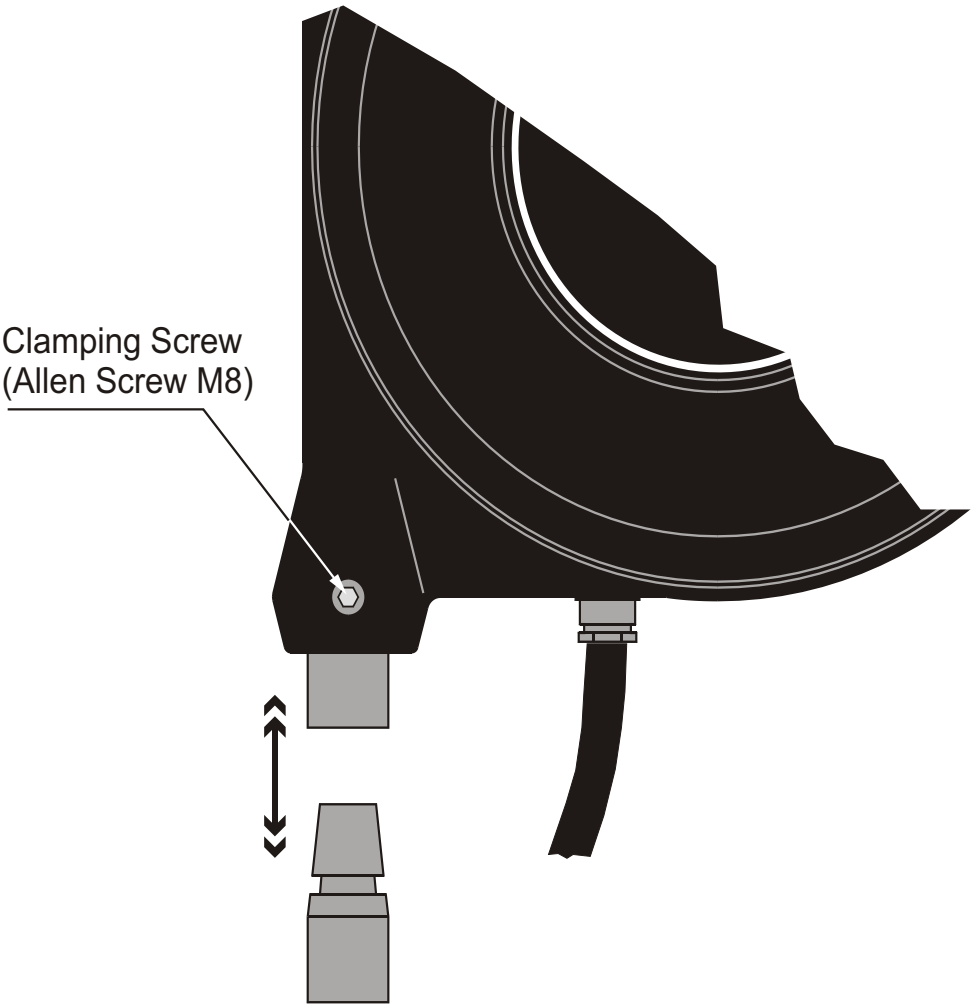


Fig. 4

ELECTRIC CONNECTION:

Fig. 5 shows an electric diagram, which is our recommendation on building up the electric system for the jigging machines on board a vessel.

Please note, that on the jigging machine, **the red cable is the +pole.**

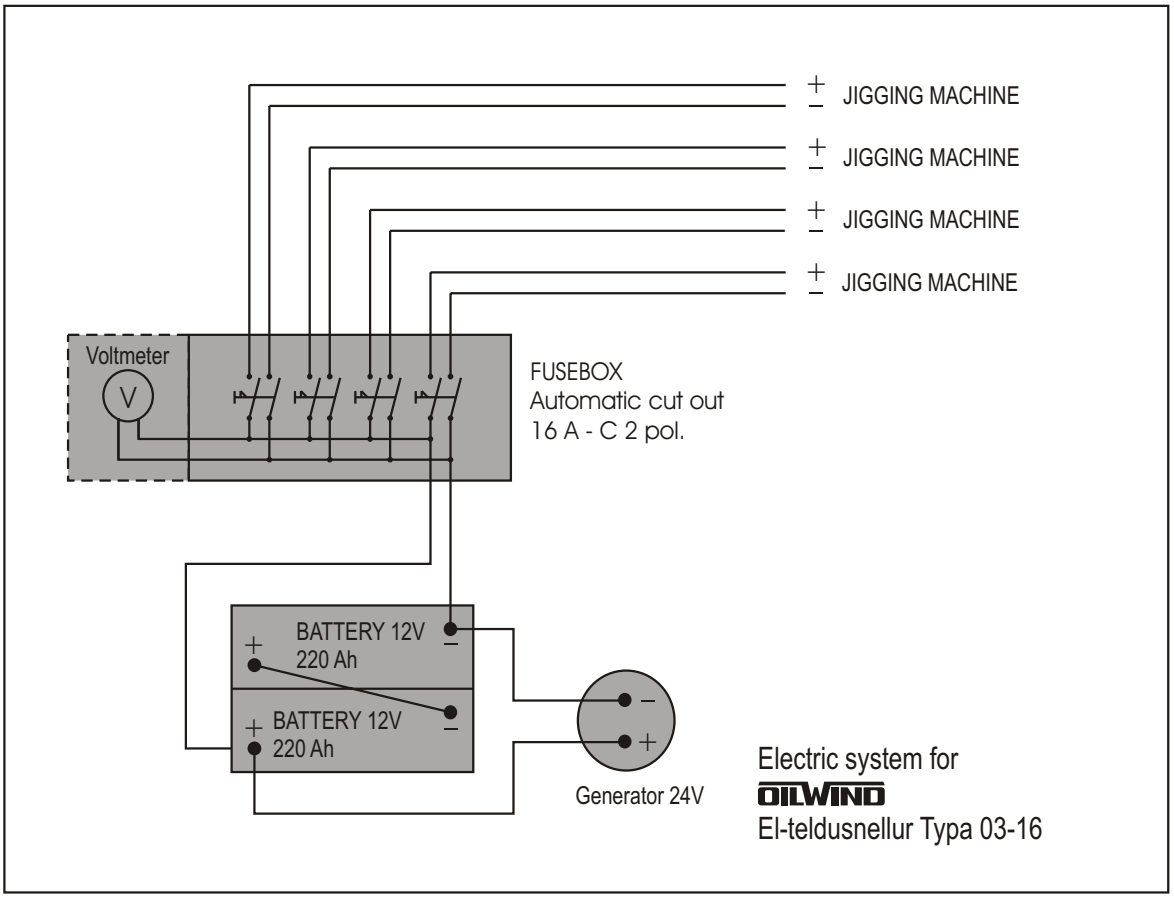


Fig. 5

Cable from generator to battery From battery to fusebox.			Cable from jigger to fusebox.	
No. of jiggers	Cable cr. section.	Max lenght	Max. lenght	Cable cr. section
max. 4	10mm^2	4,5m	7,5m	2x2,5mm^2
max. 6	16mm^2	3,8m	12,0m	2x4,0mm^2
max. 8	25mm^2	3,2m	18,0m	2x6,0mm^2

Guidance for cable dimensions

MAINTENANCE:

Weight sensing arm:

For the machine it is of great importance, that the weight sensing arm's function is smooth and frictionless. Therefore please be very careful, that there is no dirt or corrosion on the weight sensing arm's cylinder(see fig. 6 below). The cylinder needs to be coated in light oil frequently. Please make it a rule, that you check this before leaving for the fishing grounds.

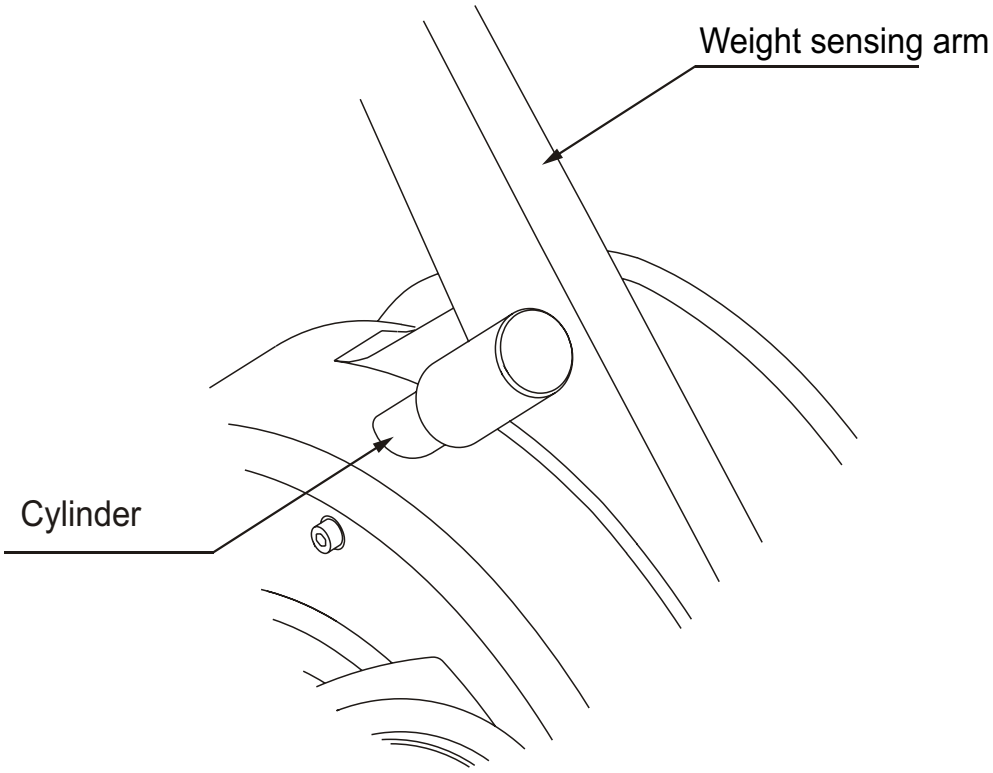


Fig. 6

MAINTENANCE:

Replacing of the fuse:
The machine is equipped with an electric fuse. The fuse is placed on the motor print board (see fig. 7 below) inside the housing. Replace the fuse by removing the housing: unscrew the screws at the end of the housing (see fig 9 on page 24) and then remove the fuse placed in the fuse socket on the print board.

The type of the fuse is: 1 pc. 5 x 20 mm Quick Acting - F 18 A 250 V).

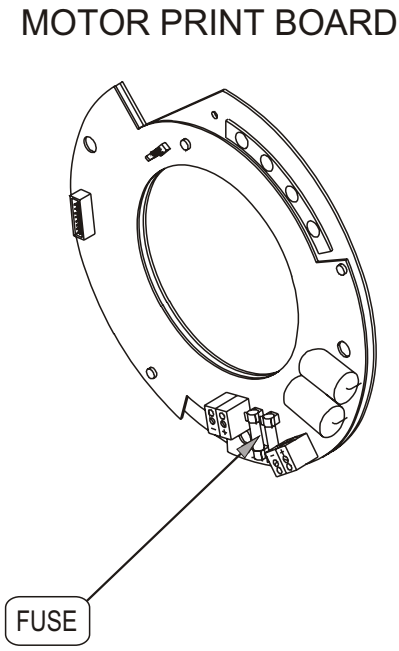


Fig. 7

Note!
Electronic parts are very sensitive, and should therefore be handled with great care.

MAINTENANCE:

Replacing of electronic print board:
When replacing the jigging machines electronic print board, please follow the instructions below:

Computer print board - (see fig. 8 below)
Unscrew the screws on the computer box.
Remove the top of the box, and unplug the cable plugs, marked FL, DP and MP, from the print board. The print board is fastened to the bottom of the computer box with 3 clips, and you will remove the print board by pressing the clips and removing it easily.

Motor print board - (see fig. 9 on page 23)
Unscrew the screws at the end of the housing..
Unplug the plugs marked Pot and TP. Release the electric wires, marked EL-inn and EL-mot, from the terminal block. Unscrew the 4 screws in the aluminium plate, marked SMP. Please note, that the print board shall not be released from the aluminium plate. Move the print board carefully out, over the motor.

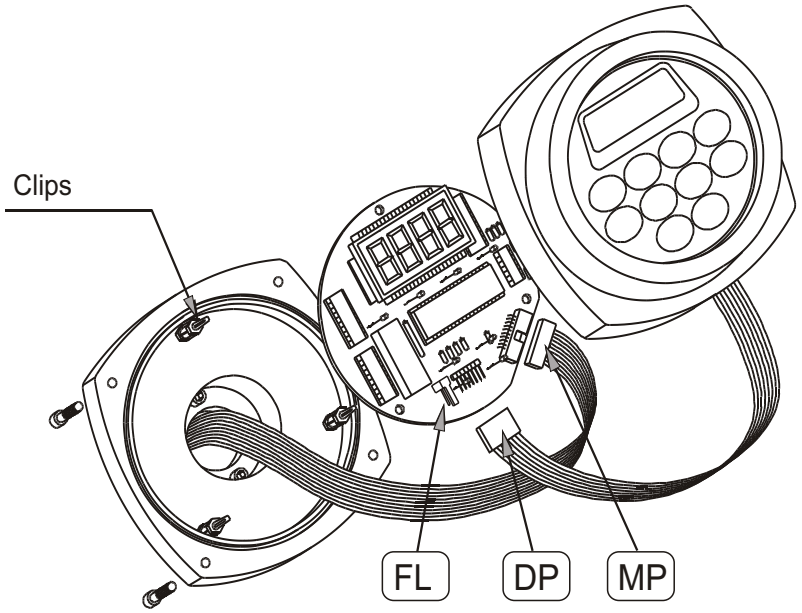


Fig. 8

Note!
Electronic parts are very sensitive, and should therefore be handled with great care. - Replacement of electronic parts and components shall be carried out in dry surroundings.

Humidity bag (please see drawing on the next page)

To protect the electric and electronic parts and components in the machine against humidity which can appear during temperature changes, there is a humidity bag (Silica Gel) inside the machine (attached to the electric motor).
Our recommendation is, that this bag will be replaced when you are servicing the machine, or at least every year.

MOTOR PRINT BOARD

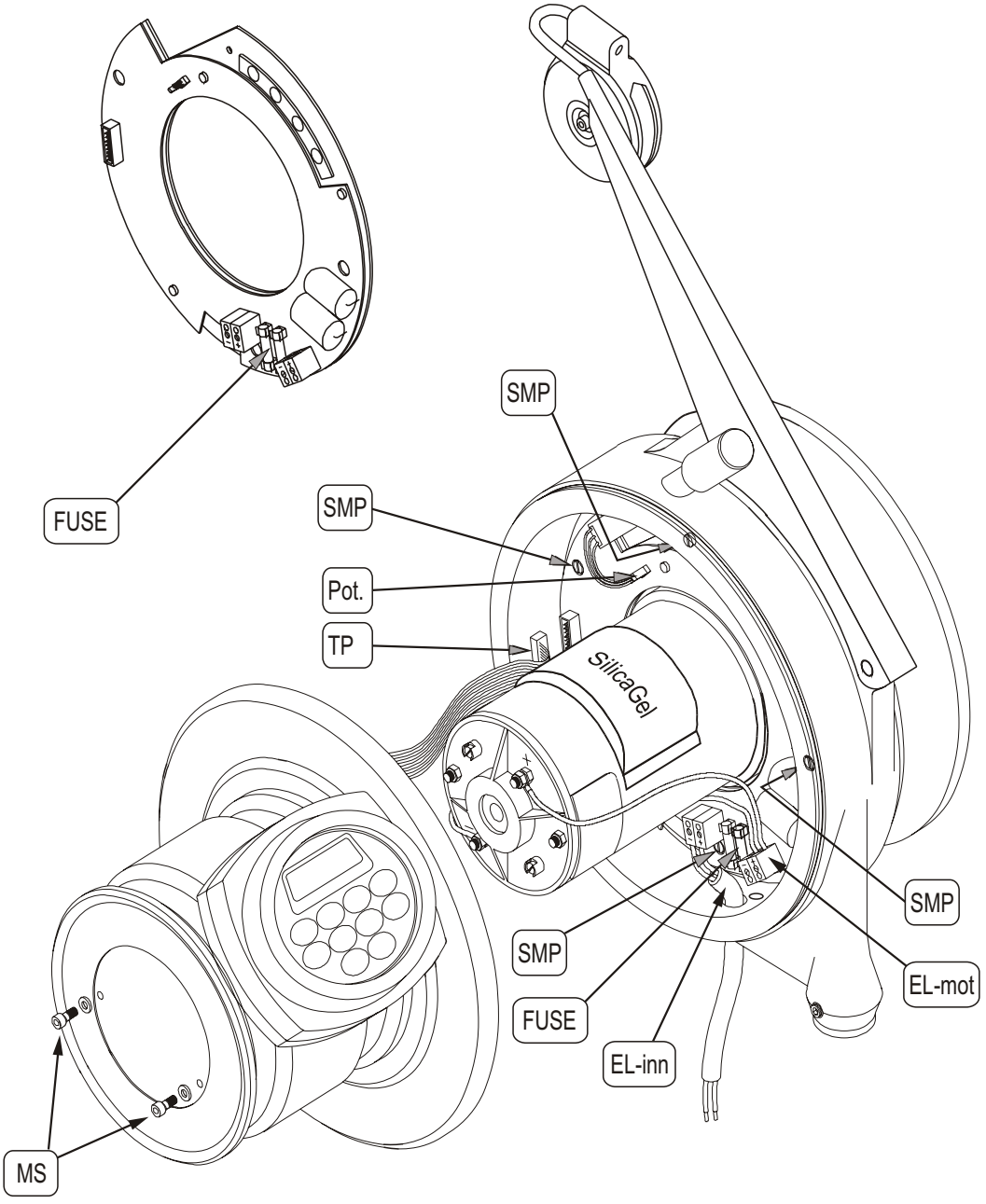


Fig. 9

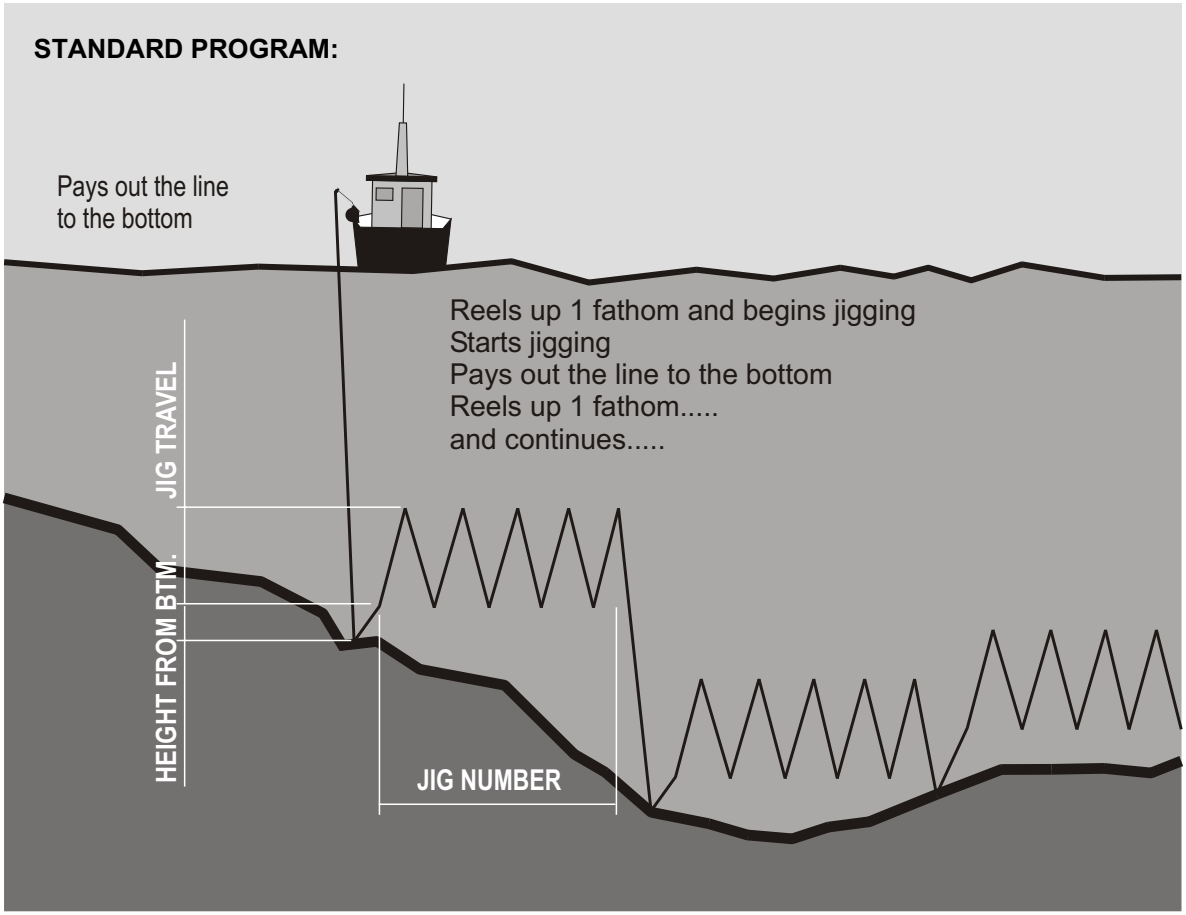


Fig. 10

Instructions:

Press the (DOWN) button. The machine pays out the line to the bottom - and starts fishing as described above. This fishing method is the machine's standard program.

If you have adjusted some values, but wish to return to the standard program, then use the CL (CLEAR) button. By pressing the button for 5 seconds, or until the whistle gives one long sound, the computer will return to the standard program.

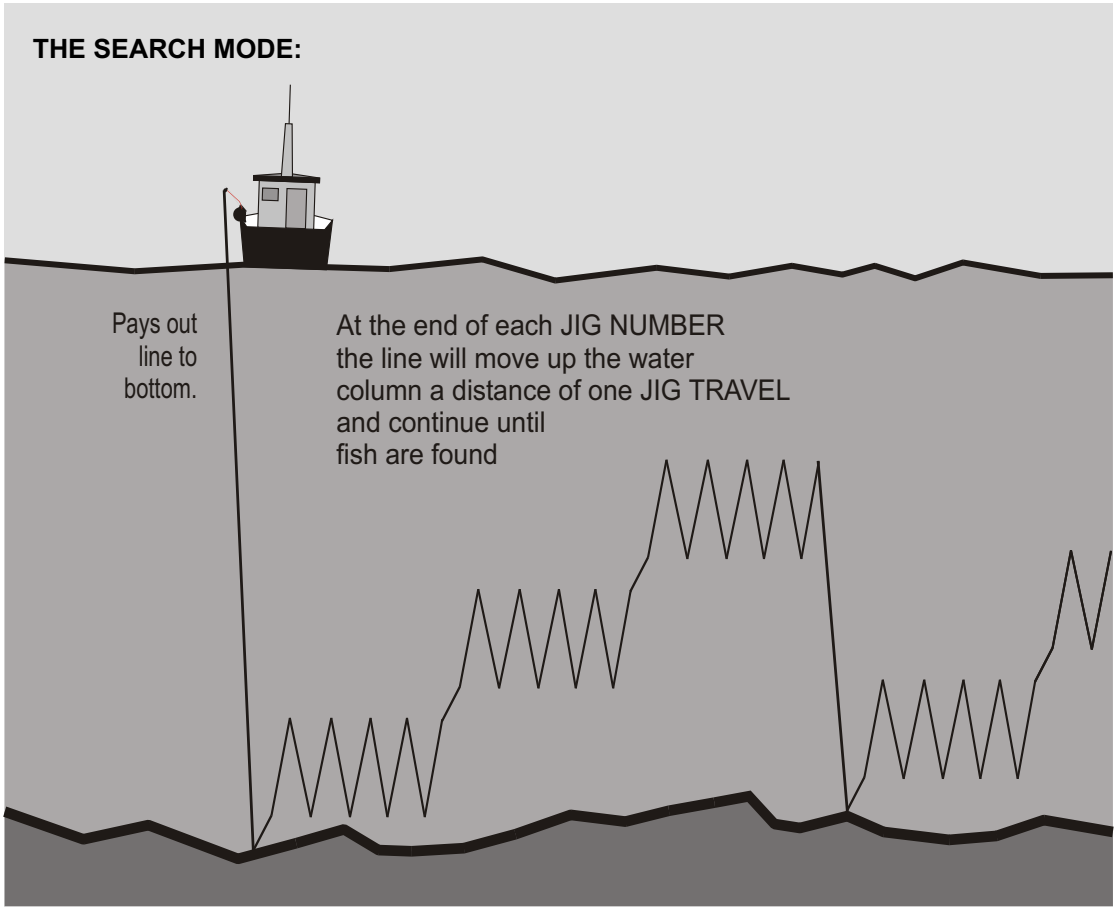


Fig. 11

Adjustment instructions:

Press the (SEARCH) button (the light starts flashing) and then the (DOWN) button. The displays shows a . (colon), and the light in the (SEARCH) button is on. The machine is now adjusted to search from the bottom and upwards the water. The machine is jigging, moves up the water and starts jigging again and so on, until it reaches the value, adjusted as the Search Range. The machine will then again pay the line to the bottom, and starts searching again (see further information in JIG FUNCTIONS, 7: SEARCH RANGE). In the standard program the Search Range is pre-set to 40, or the machine will search up to 40 fathoms. The mode can be adjusted as to your requirements.

To start fishing from the bottom again, press the (SEARCH) button, and then the (DOWN) button.

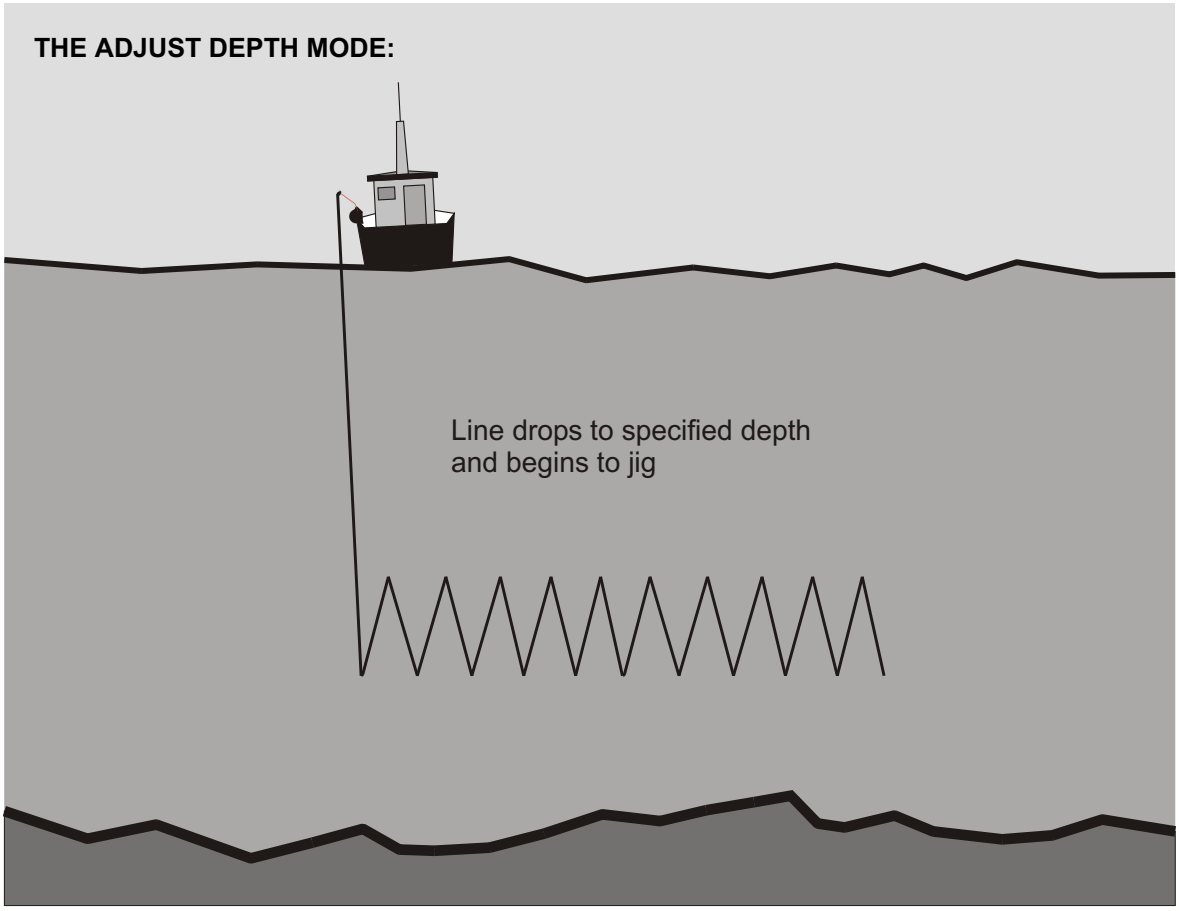


Fig. 12

Adjustment instructions:

Press the (ADJUST DEPTH) button (the light starts flashing), then adjust the planned depth by using the (PLUS) or (MINUS buttons, press the (DOWN) button, and the machine starts fishing at the adjusted depth (the button's light is on during fishing at the adjusted depth).

To start fishing from the bottom again, press the buttons as follows:
(ADJUST DEPTH), CL (CLEAR) and (DOWN).

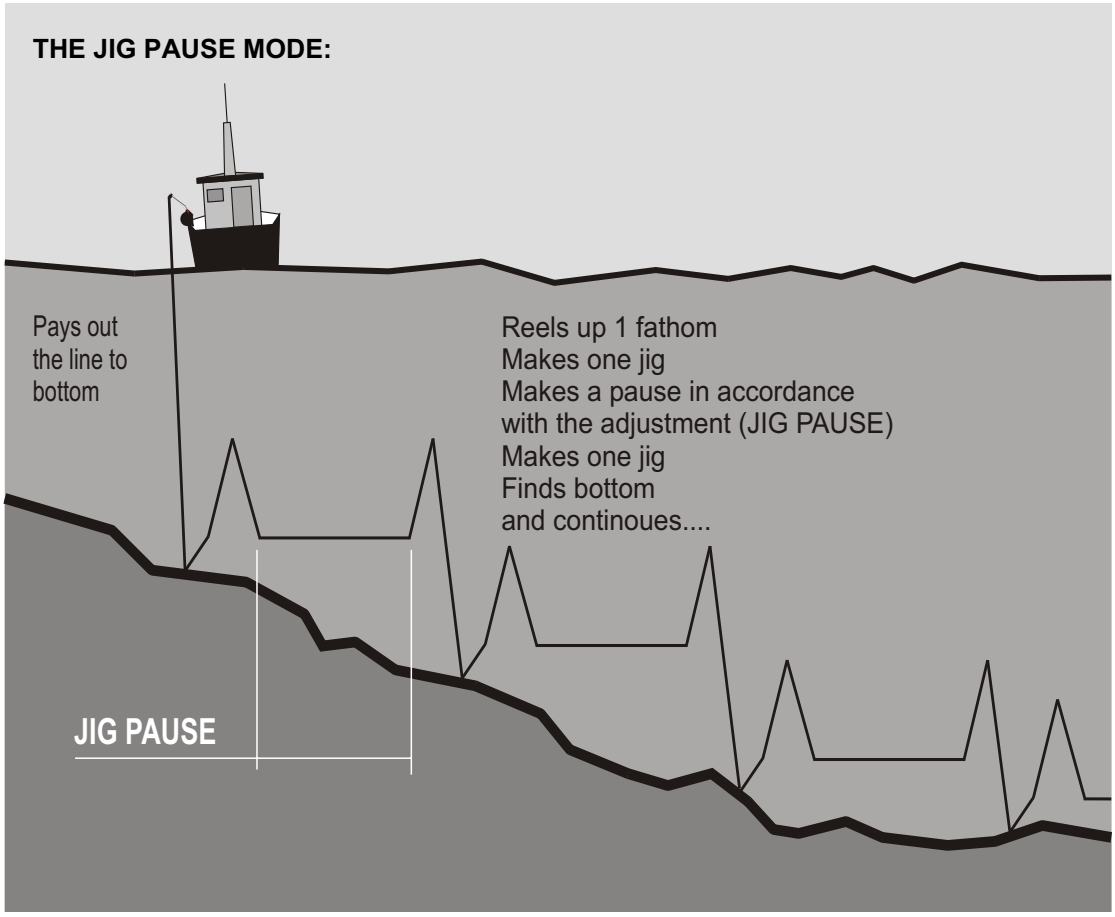


Fig. 13

Adjustment instructions:

Press the (ADJUST JIG) button (the light is on). Press as many times as necessary to get the display to show 8d. Adjust the value with the (PLUS) or (MINUS) button (the light starts flashing).
The adjustment indicates in seconds the pause between jigging period.

To confirm the adjusted value, press the (ADJUST JIG) button (the light stops flashing).

To activate the new program press the (DOWN) button.
If you wish to se how many fathoms of line are paid out, press the

(WEIGHT - DEPTH) button (the light in the (ADJUST JIG) button is switched off).

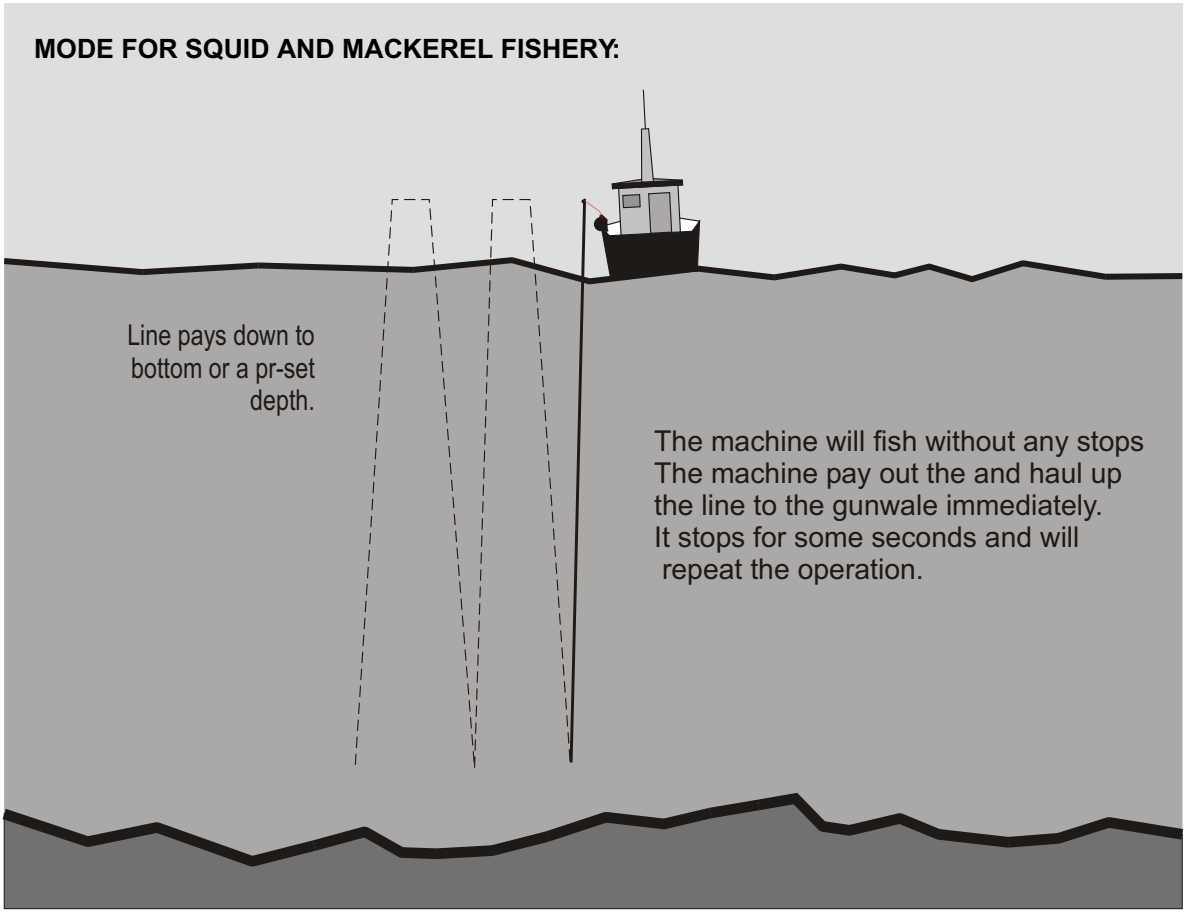


Fig. 14

Adjustment instructions:

Press the (ADJUST JIG) button (the light is on). Press as many times as necessary to get the display to show 5d. Adjust the value to 1 by pressing the (PLUS) button (the light starts flashing). To confirm the adjusted value, press the (ADJUST JIG) button (the light stops flashing).

To activate the new program press the (DOWN) button.

If you wish to see how many fathoms of line are payed out, press the (WEIGHT - DEPTH) button (the light in the (ADJUST JIG) button is switched off).

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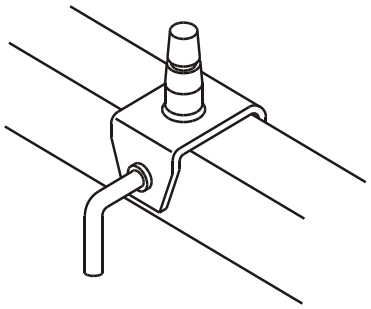
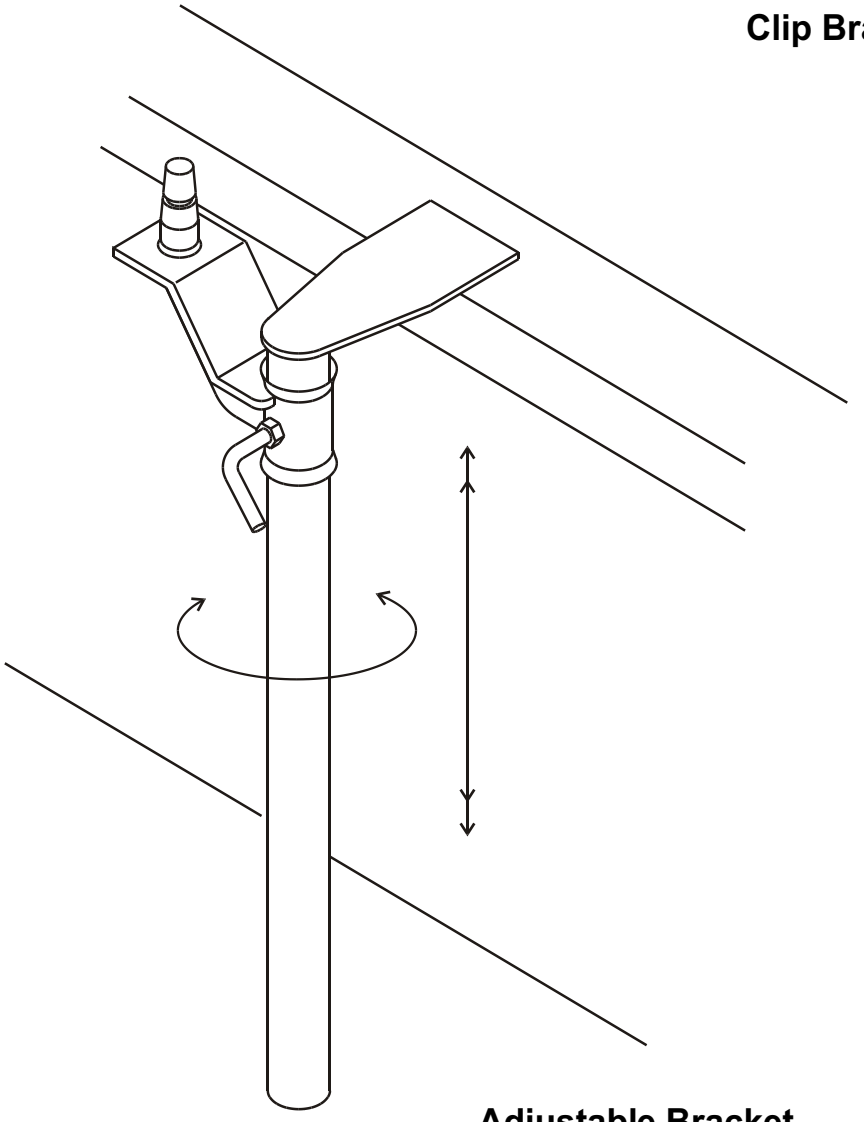
Examples of mounting brackets:



Clip Bracket

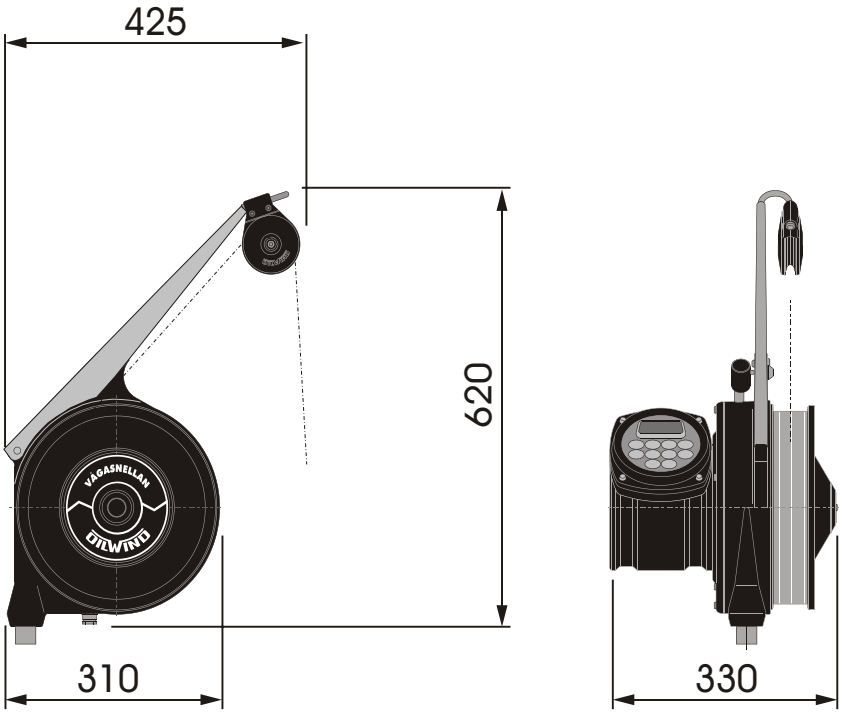


Adjustable Bracket

Technical Information:

Weight:	17,0 kg
Electric power:	24 v.
Max electric consumption:	20 Amp.
Average electric consumption:	2,5-3,5 Amp.
Speed:	0-135 rpm.

Line lenght - ø1,6mm:	400 fathoms - 730 m.
ø1,3mm:	600 fathoms - 1100 m.
ø1,0mm:	1000 fathoms - 1830 m.



Dimensions in millimeter

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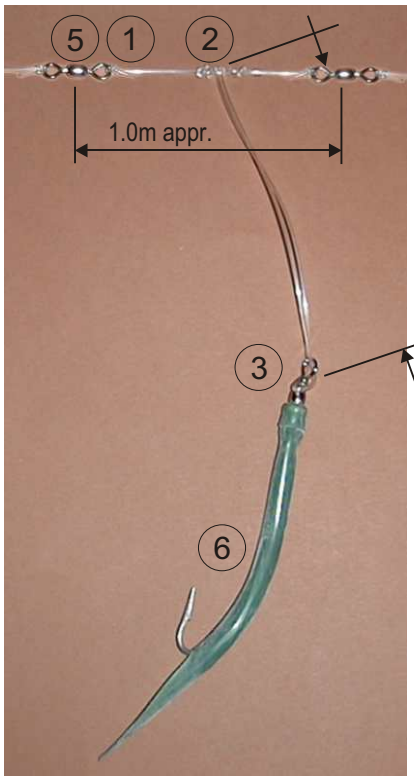
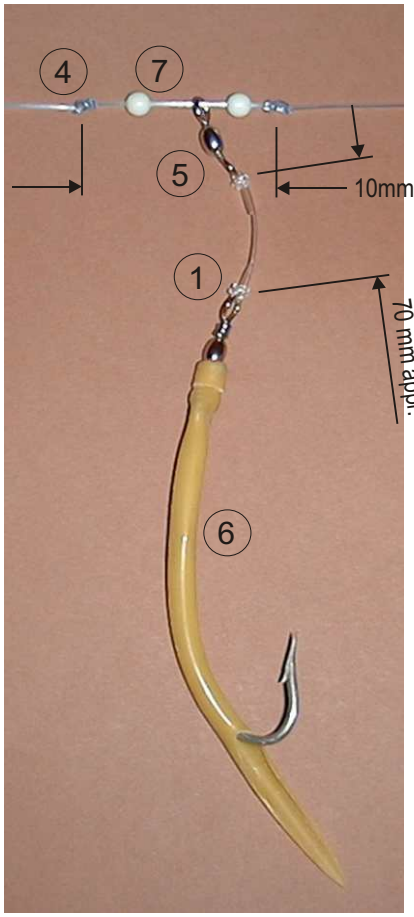
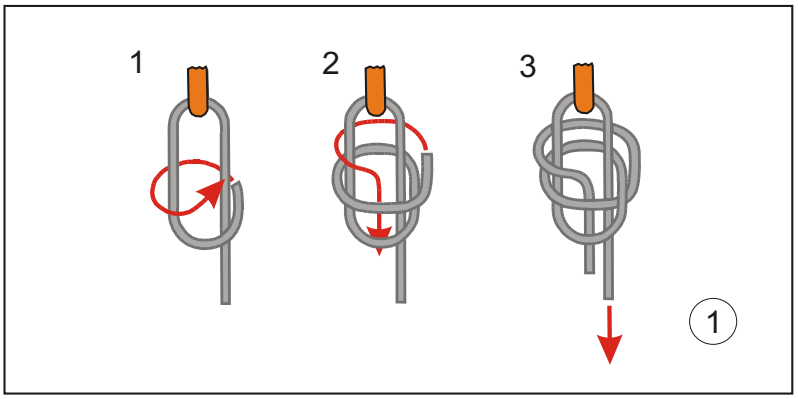
LOCAL REPRESENTATIVE:

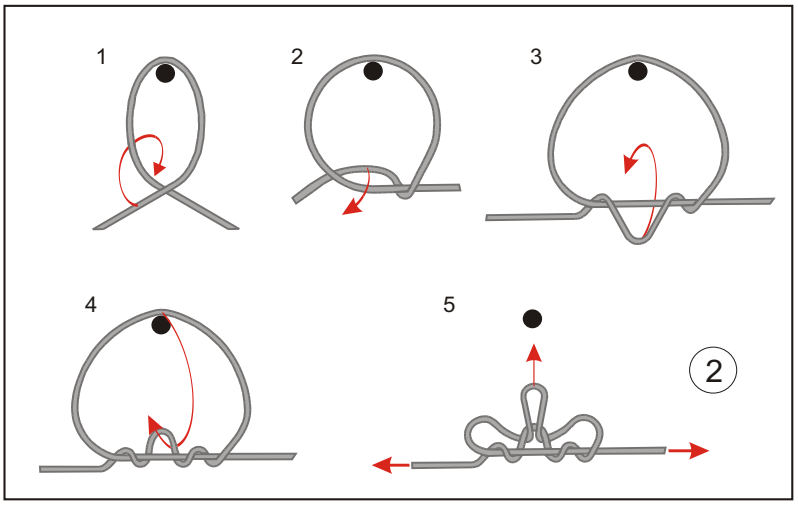
Appendix C2.–Instructions for rigging jig fishing gear.

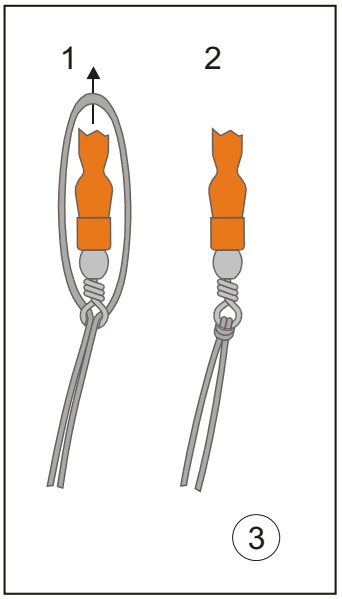
Guidance in rigging the gear

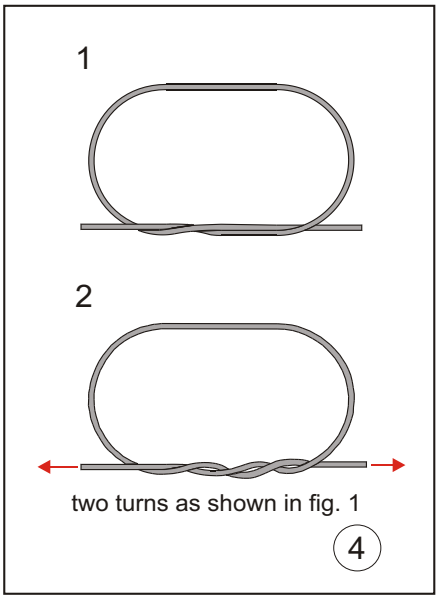












1. Knot type 1
2. Knot type 2
3. Knot type 3
4. Knot type 4
5. Swivel
6. Bait -hook
7. Plastic ball

Line used for hook set-ups can vary from 1.0 mm (100 lbs test) to 1.4 mm (150 lbs test) depending on fishery and size of fish which are targeted.

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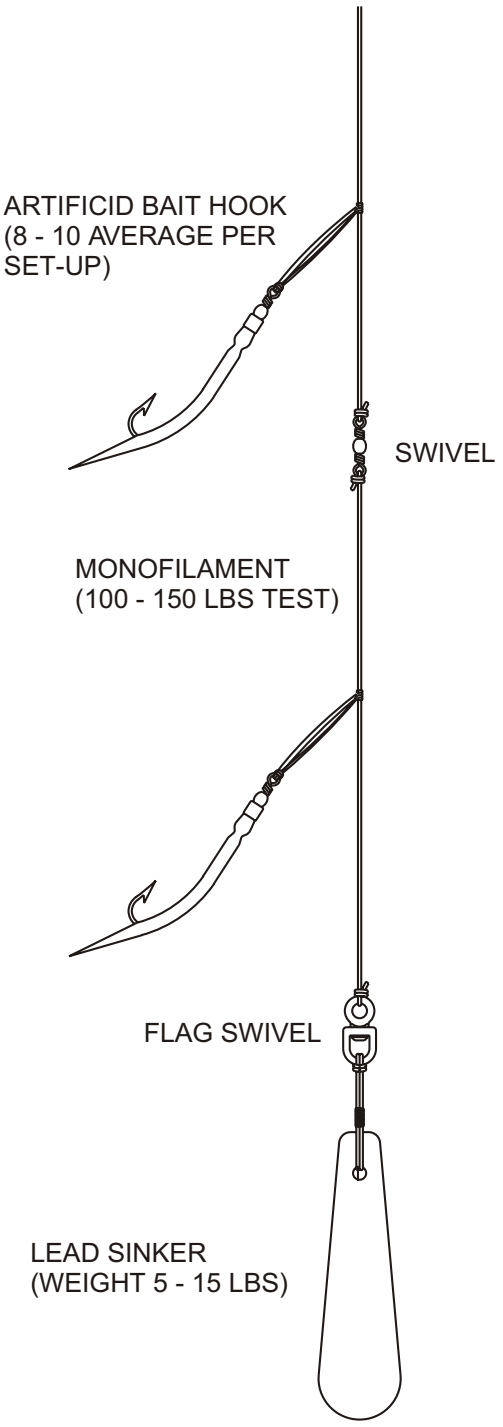
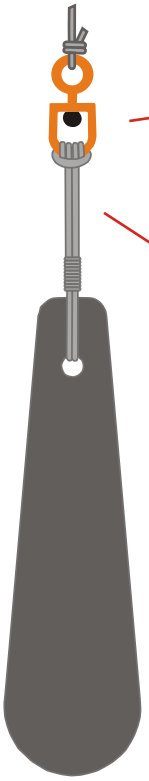
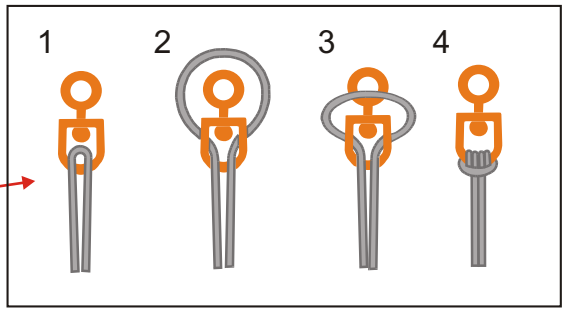
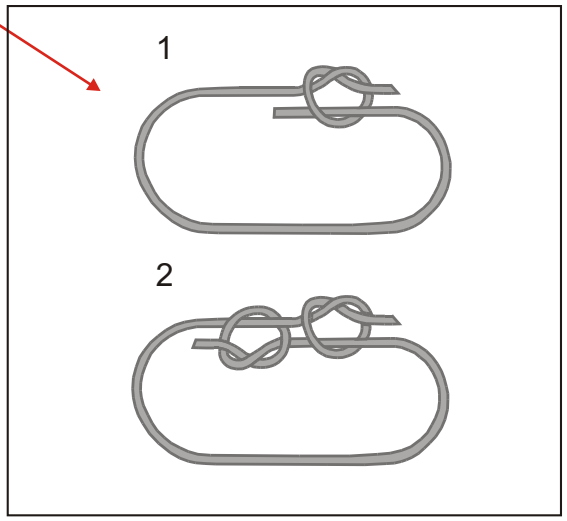
Guidance in rigging the gear

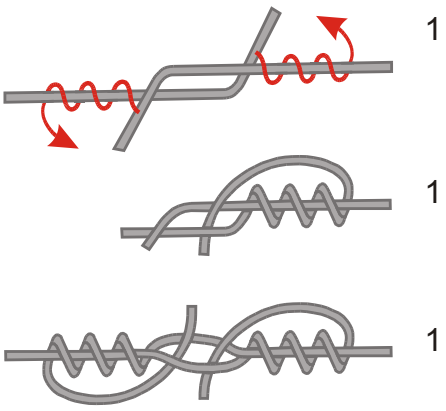








The space between each hook depends on the size of the vessel and the fishing conditions. Normal distance is equal to the the distance from the surface to the gunwhale.



Use this knot to reassemble the line when the line is broken

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